

ASSESSMENT OF PHYSICIAN RESPONSES TO ABNORMAL RESULTS OF BONE DENSITOMETRY STUDIES

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ABSTRACT

Objective: To assess how physicians who have ordered bone densitometry studies respond to abnormal results.

Methods: We conducted a retrospective review of cases from physicians affiliated with a community teaching hospital. The study sample consisted of 142 female patients with abnormal bone mineral density (BMD) who had been referred by 50 physicians (internists or gynecologists). A questionnaire was completed for each patient, providing data about further investigations, treatment interventions, and frequency of referral to a specialist in bone diseases.

Results: Of the patients diagnosed with osteoporosis on the basis of BMD studies, 20.4% had no further investigations, and 27.8% underwent only mammography. Of all the patients with osteoporosis, 10.6% received no therapy (calcium and vitamin D excluded). The majority of all patients (71.8%) received a combination of calcium and vitamin D. The most common treatment modality was hormone replacement therapy. The second most common treatment strategy was bisphosphonates. The percentage of all referrals to specialists in metabolic bone diseases was low—11.3% in the patients of internists and 14.5% in the patients of gynecologists.

Conclusion: In this study, the information provided by bone densitometry did not affect management in a substantial percentage of patients. A considerable percentage of patients underwent no further investigations to rule out secondary causes of osteoporosis. (*Endocr Pract.* 2000;6:351-356)

Abbreviations:

AACE = American Association of Clinical Endocrinologists; BMD = bone mineral density; HRT = hormone replacement therapy

INTRODUCTION

Bone densitometry is a direct, precise, and objective method for the measurement of bone mass that predicts the risk of fracture (1,2). Measurements of bone mass should be valuable to physicians when intervention for prevention or treatment of osteoporosis is being considered (3,4). The use of bone densitometry has increased dramatically during the past 5 to 10 years. How physicians are using the information from this study, however, has not been extensively analyzed.

After a bone mineral density (BMD) measurement has been performed, the requesting physician must decide what to do with the results. The cause of abnormal BMD should be determined, and diseases that may be associated with a reduced bone mass should be excluded (5-9). If the investigation is complete and the underlying cause of bone loss has been identified, the clinician may proceed with the appropriate management (10). The interpretation of bone mass measurement should also include an assessment of the relationship of the BMD findings to clinical data obtained from the patient. This overall information will help the physician make appropriate therapeutic decisions.

For accompanying editorial, see page 407.

In 1996, the American Association of Clinical Endocrinologists (AACE) published clinical practice guidelines for the prevention and treatment of postmenopausal osteoporosis (11). The AACE guidelines suggest that the patient diagnosed with osteoporosis should undergo laboratory evaluation to exclude secondary causes of bone loss. This evaluation should include a complete blood cell count, serum chemistry studies (calcium, phosphate, liver enzymes, total alkaline phosphatase,

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creatinine, and electrolytes), and urinalysis including pH. In individual patients, additional laboratory assessment should be considered on the basis of the physician's degree of clinical suspicion for other causes of bone loss. Further testing may include thyrotropin, 24-hour urinary calcium excretion, erythrocyte sedimentation rate, parathyroid hormone concentration, 25-hydroxyvitamin D concentration, and serum or urinary protein electrophoresis. The National Osteoporosis Foundation has also published clinical practice guidelines for the prevention and treatment of osteoporosis (12). Their guidelines recommend that the physician be alerted to the possibility of the presence of secondary causes of osteoporosis.

Only limited studies have addressed how physicians investigate and treat osteoporosis (13,14). Because the use of bone densitometry is rapidly increasing, a growing need exists to determine how primary-care physicians, gynecologists, and other physicians use the information derived from bone densitometry studies.

In the current study, we assessed how physicians who had ordered bone densitometry studies used the results. We also analyzed the differences between internists and gynecologists in their approach to osteopenia and osteoporosis. Moreover, we evaluated the type and frequency of the studies ordered for further investigation of abnormal BMD results, the specific type of pharmacologic and other interventions instituted, and the frequency of referral to a specialist.

METHODS

Study Design

We compiled a list of all patients who underwent a dual-energy x-ray absorptiometry study (of the hip and spine) for the first time, regardless of indication, between January 1997 and March 1997 at a community teaching hospital. In this group, we identified 283 consecutive patients who had abnormal findings and consequently were diagnosed as having osteopenia or osteoporosis, as defined by the World Health Organization criteria (15). Fifty patients sent for BMD study by either physicians specializing in bone disease (endocrinologists or rheumatologists) or physicians not on the hospital staff were excluded from the study. The patients sent for BMD studies by a bone disease specialist were excluded from analysis because one of the main objectives of the study was to assess how primary-care physicians and gynecologists managed patients with bone loss. Patients of physicians not on the hospital staff were excluded from the study because their medical records were not accessible. Thus, 233 questionnaires (one for each patient) were sent to the remaining 80 referring physicians. Data collection was completed within 12 months after testing.

The questionnaire asked about what types of investigations were performed (complete blood cell count, serum chemistry studies, vitamin D level, serum or urine protein immunoelectrophoresis, mammography, and x-ray or other studies), what dietary or pharmacologic interven-

tions were implemented (calcium, vitamin D, estrogen, bisphosphonates, calcitonin, raloxifene, or other), and whether a referral to a specialist (endocrinologist or other) was made as a result of abnormal results of the bone density test. We assumed that mammography (for those women who had not undergone this study as a part of cancer prevention already) would be a reasonable test to obtain to exclude a malignant lesion before initiation of hormone replacement therapy (HRT) in a postmenopausal woman (16). In some instances, responders noted on the questionnaires that some patients had laboratory or imaging tests done before the results of the bone density study were known. We have included those tests in the investigative part of the study because the physicians clearly indicated that those tests were used in the evaluation that was undertaken after they became aware of abnormal BMD findings. Except where noted, these investigations are not distinguished from the other groups.

This study was approved by the Human Research and Investigation Committee of Newton-Wellesley Hospital (Newton, Massachusetts).

Statistical Analysis

Data from the questionnaires were entered into a Microsoft Excel spreadsheet, and summary numbers and statistical analyses were calculated with use of SAS statistical software. Percentages were compared by using Pearson's chi-square test for independent samples.

RESULTS

We received 121 completed questionnaires from 49 physicians, and 3 physicians provided us with the necessary information to complete 25 questionnaires ourselves, for a total of 146 questionnaires. The completed questionnaires of four patients from two physicians were subsequently excluded from analysis; thus, the final sample size was 142 patients from 50 physicians. Of the four excluded questionnaires, three were eliminated from the study because the patients had been sent for bone densitometry by orthopedic surgeons (with expertise in bone disease), and the fourth was excluded because it was the only questionnaire completed by a family practitioner, and any generalization about this specialty would not have been possible from only one patient.

The numbers of patients stratified by the type of disease and the physician specialty are shown in Table 1. All physician-responders included in the analysis practiced either internal medicine ($N = 31$) or obstetrics and gynecology ($N = 19$). Of the overall study group of 142 patients (all of whom were women), 88 had osteopenia, and 54 had osteoporosis. The mean age of all patients was 61.0 ± 10.6 years.

Fourteen patients were already receiving estrogen and one patient was receiving bisphosphonate therapy before the bone density study was performed. In addition, seven patients were premenopausal. We excluded these 22 patients from the analysis of pharmacologic intervention.

Table 1
Study Patients Stratified by Type
of Disease and Physician (N = 142)

Characteristic	Patient	
	No.	%
Type of disease		
Osteopenia	88	62.0
Osteoporosis	54	38.0
Type of physician		
Internist	80	56.3
Gynecologist	62	43.7
Type of disease and physician		
Osteopenia—internist	48	33.8
Osteopenia—gynecologist	40	28.2
Osteoporosis—internist	32	22.5
Osteoporosis—gynecologist	22	15.5

The premenopausal patients were excluded because hormonal therapy would not have been used in this group if a major BMD abnormality had been found.

Additional Investigations

Of the 54 patients found to have osteoporosis, 11 (20.4%) had no further investigation performed (Table 2). The frequency was about the same between patients of internists and those of gynecologists ($P = 0.90$). Mammography only, with no other further investigation,

was the most common investigative modality used (in 27.8% of the patients with osteoporosis). Approximately 58% of the patients referred for BMD study by gynecologists and 6% of the patients referred by the internists had mammography as the only additional investigation ($P < 0.001$).

The second most common investigation was the combination of complete blood cell count, serum chemistry studies, and mammography. More patients referred for BMD study by internists (33.8%) had this combination of tests in comparison with patients referred by gynecologists (3.2%) ($P < 0.001$).

In only 2.1% of all patients were vitamin D levels assessed.

Intervention

Administration of Calcium and Vitamin D

The majority of the patients (approximately 72%) received a combination of calcium and vitamin D (Table 3). This combination intervention was given to 87.5% of the patients with osteoporosis referred for BMD study by internists and 81.8% of the patients with osteoporosis referred by gynecologists ($P = 0.56$). The corresponding numbers for such intervention in the patients with osteopenia referred by internists and gynecologists were 64.6% and 62.5%, respectively ($F = 0.84$)—considerably lower than for those with osteoporosis.

Overall, 14.8% of patients did not receive treatment with either calcium or vitamin D. All patients with osteoporosis referred by gynecologists received either calcium or vitamin D and calcium, whereas 9.4% of patients with osteoporosis referred by internists did not receive either ($P = 0.14$).

Table 2
Additional Investigations in Patients
With Abnormal Results of Bone Densitometry (N = 142)*

Investigation	Overall		Type of disease				Type of physician			
	No.	%	Osteopenia		Osteoporosis		Internist		Gynecologist	
			No.	%	No.	%	No.	%	No.	%
None	12	29.6	32	35.2	12	20.4	24	30.0	18	29.0
Mammography only	41	28.9	26	29.5	15	27.8	3	6.3	38	59.0
CBC, serum chemistry, and mammography	28	20.4	18	20.5	11	20.4	27	33.8	2	3.2
CBC, serum chemistry, mammography, and x-ray	11	7.7	3	3.4	8	14.8	10	12.5	1	1.6
CBC and serum chemistry	7	4.9	4	4.5	3	5.6	6	7.5	1	1.6
Other	12	8.5	6	6.8	6	11.1	8	10.0	4	6.5
Total	142	100.0	88	100.0	54	100.0	80	100.0	62	100.0

*CBC = complete blood cell count.

Table 3
Administration of Calcium and Vitamin D
in Patients With abnormal Results of Bone Densitometry (N = 142)

Investigation	Osteopenia						Osteoporosis			
	Overall		Internist		Gynecologist		Internist		Gynecologist	
	No.	%	No.	%	No.	%	No.	%	No.	%
Neither	21	14.8	8	16.7	11	25.0	5	9.4	11	11.1
Calcium only	18	12.7	9	18.2	5	12.5	9	16.7	9	18.2
Vitamin D only	1	0.7	0	0.0	0	0.0	1	1.9	0	0.0
Calcium and vitamin D	102	71.8	31	64.6	25	62.5	28	57.5	28	31.8
Total	142	100.0	48	100.0	40	100.0	32	100.0	29	100.0

Pharmacologic Therapy

Overall, the most common treatment modality was HRT, being prescribed to 38.3% of all patients. HRT was more common in the gynecologist-referred group (42.3%) than in the internist-referred group (23.5%) ($P = 0.03$). The second most common treatment modality was bisphosphonates only, more frequently prescribed to the patients referred by internists (17.7%) than to the patients referred by gynecologists (13.5%) ($P = 0.53$). The combination of HRT and bisphosphonates was used in 6.7% of all patients. Of all patients with osteoporosis, 10.6% received no therapy.

The percentages of the various pharmacologic combinations used overall and by both disease and physician type are summarized in Figure 1. Patients referred by internists were less likely than those referred by gynecologists to receive any therapy for either type of bone loss. In the patients with osteoporosis, 14.3% of those referred by internists received no therapy in comparison with 5.3% of those referred by gynecologists ($P = 0.33$).

Referral to a Specialist

Of the 142 patients with abnormal BMD results, 87% were not referred to a specialist. Seven percent were referred to an endocrinologist, 1.4% to a rheumatologist, and 4.2% to other specialists. Overall, patients of gynecologists were referred to endocrinologists more often (11.3%) than were patients of internists (3.8%) ($P = 0.08$). The percentages for all referrals were 11.3% for the patients of internists and 14.5% for the patients of gynecologists ($P = 0.56$).

DISCUSSION

The purpose of this study was to assess how the results of bone densitometry are used for actual intervention, either investigative or therapeutic. We wanted to determine whether the information obtained from a BMD study affects a patient's management. In our study, we assessed each abnormal finding on BMD study, regardless

of the indication, age, medical condition, or hormonal status of the individual patient, inasmuch as every patient with a diagnosis of osteoporosis should ideally undergo further investigation and then receive treatment (5,10,11).

Our results show that 30% of the 142 study patients with abnormal BMD findings did not undergo further investigation to identify the cause of the bone loss. The most striking finding is that 20% of the patients with osteoporosis had no further investigation and 28% had only a mammogram. Because mammography may not be considered a primary investigative study for bone loss, a question could be raised about whether mammography was done in response to the abnormal findings on bone densitometry or in anticipation of potential HRT or for other reasons. If we assume that mammography was not done in response to an abnormal BMD result, then almost 50% of the patients with osteoporosis did not undergo additional workup after osteoporosis was diagnosed.

A more complete investigation for bone loss was performed more often in patients sent for BMD study by internists than by gynecologists, but even in that group, fewer than half of the patients had more extensive studies. Patients with osteopenia from either group were less likely to undergo assessment than were patients with osteoporosis.

We assumed that all patients with abnormal BMD should be instructed in the use of calcium and vitamin D but that this should not be the only intervention, especially for established osteoporosis (17). All patients require age-corrected physiologic doses of calcium and vitamin D (18,19). For that reason, we divided the intervention part of the study into administration of calcium and vitamin D and other pharmacologic intervention.

Our first observation about treatment was that most of the patients received a combination of calcium and vitamin D in both the gynecologist- and internist-referred groups. Nevertheless, almost 10% of patients with osteoporosis referred by internists did not receive either calcium or vitamin D, whereas all patients with osteoporosis referred by gynecologists received either calcium alone or

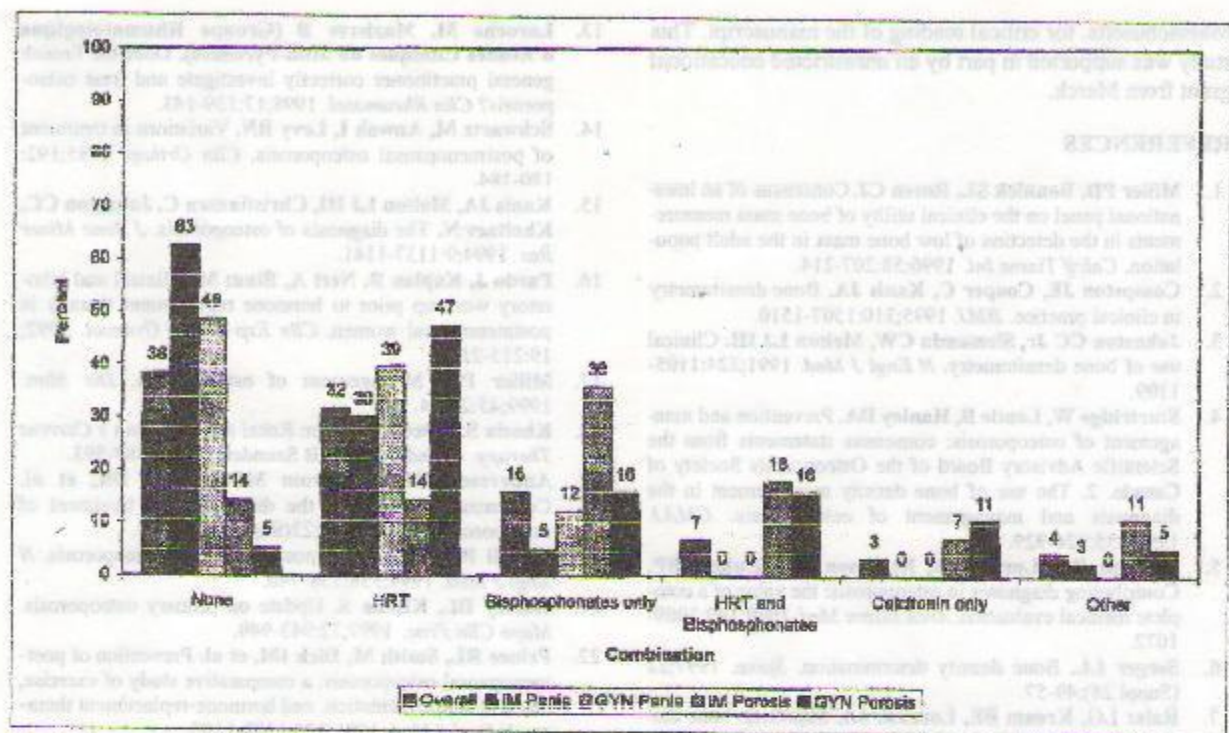


Fig. 1. Pharmacologic interventions in 120 female patients with abnormal results of bone mineral density studies. See text for further details. *GYN* = gynecologist-referred patients; *HRT* = hormone replacement therapy; *IM* = internal medicine (internist)-referred patients; *Pasta* = osteopenia; *Poro* = osteoporosis.

calcium plus vitamin D. Patients with osteopenia from either group were less likely to receive calcium or vitamin D than were patients with osteoporosis.

Apart from calcium and vitamin D, our data show that a substantial percentage of the patients with osteoporosis received no therapy. We assume that this lack of pharmacologic intervention occurred because many physicians consider calcium and vitamin D adequate therapy. Another reason may be patient refusal or intolerance of pharmacologic therapy, a comment that was noted incidentally on a few questionnaires; however, the exact frequency is unknown because the issue was not addressed specifically by the questionnaire. Even with an element of patient refusal or intolerance of one agent, many pharmacologic options are now available to treat bone loss (20,21).

HRT was used significantly more often in the group of patients referred by gynecologists, as other studies have demonstrated (14), whereas bisphosphonate therapy was used slightly but not significantly more often in internist-referred patients. The increased use of HRT by gynecologists may be attributed to the fact that they are more familiar with this treatment modality than are internists. Overall, patients sent for BMD studies by gynecologists were more likely to be treated than were patients referred by internists. Patients with osteopenia from either referral group were significantly less likely to receive any therapy in comparison with patients who had osteoporosis.

Preventive therapy with hormonal or nonhormonal agents has been clearly shown to be efficacious and should be considered for postmenopausal women to prevent bone loss (22-25).

In analysis of the referral part of the study, our results show that most patients were not referred to a specialist. When patients were referred, a consultation with an endocrinologist was most often sought.

CONCLUSION

Our study indicates the need to emphasize that patients with the diagnosis of osteoporosis should always undergo assessment to rule out secondary causes of the bone loss. In addition, osteoporosis should be treated with pharmacologic agents as well as calcium and vitamin D. Clearly, further studies are needed to determine ways to make better use of and to enhance the understanding of the results of bone densitometry.

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