

Original Article

Use of Bone Densitometry by Ontario Family Physicians

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Abstract. A stratified (urban/rural), computer-generated random sample of 797 Ontario members of the College of Family Physicians of Canada received a self-administered questionnaire by mail. The questionnaire examined current use of bone densitometry, focusing on reasons for its use, factors that limit use, and features of the report that are helpful to the family physician in subsequent patient management. The response rate was 64% (457/711) after excluding 77 physicians who no longer practice family medicine. Ninety-two percent of the physicians used densitometry; of these, 97% ordered the test in the past year. Compared with urban physicians, rural physicians were more likely to 'never use densitometry' ($p=0.04$). Rural physicians who reported using densitometry used it less frequently ($p=0.002$), were less likely to have local access ($p=0.001$), and were less confident in its use ($p=0.004$) than their urban counterparts. Risk factors and hormone replacement therapy decision-making were ranked equally as the most frequent reasons for ordering the test, followed by follow-up. Few physicians identified limits to their use of densitometry. Female physicians used densitometry more frequently ($p=0.03$) and were more confident in its use ($p=0.02$). Features of the bone density report found to be most helpful were the statement of fracture risk, suggestions for further investigation, management and follow-up, and percent reduction in bone density compared with age-matched controls. The use of bone densitometry by Ontario family physicians is consistent with published guidelines. These physicians identified the estimate of fracture risk and suggestions for investigation and management

as the most helpful features of the bone density report. This suggests a role for the incorporation of clinical data in bone density reporting.

Keywords: Bone densitometry; Family practice; Osteoporosis; Physician's practice patterns; Questionnaires

Introduction

Although controversy exists as to whether screening with bone densitometry reduces fracture incidence, there is evidence that knowledge of reduced bone mineral density (BMD) influences a woman's decision-making regarding institution of osteoporosis therapy (such as hormone replacement therapy (HRT) or other drugs), altering dietary calcium and caffeine intake, and increasing exercise [1]. While universal screening of bone mass using bone densitometry is not recommended, guidelines have been proposed for the use of densitometry [2–4]. These are reflected in the recommendations of the Osteoporosis Society of Canada (OSC), published in the form of clinical practice guidelines for the diagnosis and management of osteoporosis [5]. While guidelines exist, there are no data on whether use of bone densitometry is consistent with current recommendations and, if not, what the barriers are to recommended use. Potential barriers to the use of densitometry include availability of the test (there is significant geographic variation in the availability of densitometry); unfamiliarity with the value of, and indications for densitometry; variation in physician opinion regarding the usefulness of densitometry; and difficulty interpreting the results of the test and applying them to patient management [6–8]. Current reporting may not meet the needs of primary care physicians, and it has been

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suggested that the lack of standardized reporting may be problematic [8]. Although recommendations have been made regarding the content of a bone density report [8,9], data are limited on which components of a bone density report primary care physicians find helpful in patient management [10,11].

This study was done in the province of Ontario, Canada, with a population of over 11.4 million. This was an ideal population to study because Ontarians have universal comprehensive health insurance coverage, so that insurance status was not a barrier to care. The purpose was: (1) to examine whether the current use of bone densitometry by family physicians is consistent with published recommendations and, if not, to identify the barriers to recommended use; and (2) to assess the opinions of primary care providers on the usefulness of individual components of the bone density reports that they receive.

Methods

Seven hundred and ninety-seven family physicians randomly selected from the membership of the College of Family Physicians of Ontario, and stratified by urban/rural practice location, were surveyed. Physicians were eligible for the study if they (1) were currently in family/general practice, (2) had postmenopausal women in their practice, and (3) practiced at the College mailing list address.

Survey Questionnaire

Using a self-administered questionnaire, respondents were asked about access to densitometry in their community, frequency of use of densitometry, reasons for ordering a bone density test, factors that limit their use of densitometry, components of the bone density report that help them in patient management, and confidence in the use of bone densitometry (from 1–10, where a higher score indicated greater confidence).

Physicians identified all reasons for ordering a bone density test over the past year and then ranked the reasons from 'least frequent' to 'most frequent' on a 5-point Likert scale. Similarly, factors that limited their use of densitometry were ranked from 'not at all limiting' to 'extremely limiting', and the usefulness of various components of the bone density report were ranked from 'not at all helpful' to 'extremely helpful'. Respondents were also asked to indicate their agreement with a number of statements regarding the use of bone densitometry in screening for and management of osteoporosis on 5-point scales with anchors at 1 ('strongly disagree') and 5 ('strongly agree').

Demographic data were collected, including age, gender, Canadian College of Family Physician (CCFP) status, practice type and site, and an estimate of the proportion of their patients who are postmenopausal

women. Respondents were also asked to estimate the number of hours of continuing medical education they had received in osteoporosis over the preceding year.

The questionnaire was piloted by local family physicians and was revised accordingly. The final questionnaire took approximately 5 min to complete. This questionnaire was mailed in January 1998. A covering letter explained the purpose and voluntary nature of the study and noted the endorsement of the study by the Osteoporosis Society of Canada. A modified Dillman method [12] was used for the survey, with two follow-up mailings to non-respondents. All questionnaires and return envelopes were coded numerically to maintain confidentiality. Respondents were compared with nonrespondents using data derived from the Canadian Medical Directory (year of graduation, CCFP status and university affiliation) [13]. The study protocol was approved by the Research Ethics Board at Women's College Hospital, Toronto, Ontario.

Statistical Analysis

Physicians' opinions and reported behaviors were summarized using descriptive statistics. Differences between urban and rural physicians were analyzed using the *t*-test for continuous variables and the Wilcoxon rank sum test for ordinal variables. Nominal data were analyzed using chi-square and Fisher exact tests. Statistical significance was considered at a two-tailed level of 0.05, with correction for multiple comparisons. All analyses were performed using SAS version 6.12.

Results

Of the 797 physicians surveyed, 86 were excluded (6 were untraceable and 80 were ineligible: no longer practising family medicine (70), extended leave of absence (3) or retirement (7)). Thus, analyses were conducted on 457 completed questionnaires from 711 physicians, an overall response rate of 64.3%. Respondents did not differ from nonrespondents except that they were more likely to practice in a rural area (rural response rate, 68%; urban response rate, 58%; $p < 0.005$). Respondent characteristics are shown in Table 1.

Access to Densitometry

The responses to questions on access to and use of densitometry are summarized in Table 2. Rural physicians were less likely to have densitometry available locally; 14.5% indicated that it was not available within a reasonable travel distance compared with only 5.3% of urban physicians ($p = 0.001$). None the less, of the 457 respondents, 423 (92%) had used densitometry (urban: 96%, rural: 90%), and 81% of

Table 1. Demographics and practice characteristics of responding Ontario family physicians

Respondent characteristic	Urban (n = 208)	Rural (n = 249)	p value
Mean age (years), (SD)	39.8 (8.4)	41.1 (8.1)	NS
Male physicians (%)	55.3%	60.1%	NS
Full-time practice (%)	74.9%	88.6%	0.001
Group practice (%)	69.4%	56.0%	0.005
University affiliation (%)	8.5%	6.7%	NS
Mean years since graduation (SD)	14.3 (8.5)	15.0 (8.7)	NS
Certificants of the Canadian College of Family Practice (%)	89.4%	91.9%	NS

Table 2. Access to, and use of bone densitometry by Ontario family physicians

Item	Urban (n = 208)	Rural (n = 249)	p value
Densitometry available locally (%)	88.0%	39.5%	0.001
Densitometry available within a reasonable travel distance (%)	94.8%	85.5%	0.001
Does not use densitometry (%)	4.0%	10.0%	0.04
Ordered bone density test in past year (%)	94.2%	87.4%	0.01
No. of bone density tests ordered in past 4 weeks (SD)	3.4 (3.8)	2.3 (2.9)	0.002
Mean confidence score (1–10) for densitometry use (SD)	7.2 (1.8)	6.7 (2.1)	0.004
Mean % postmenopausal women in practice (SD)	18.3% (10.5)	19.8% (9.5)	NS
Mean % of osteoporosis patients referred to specialist (SD)	25.7% (1.8)	22.7% (1.5)	0.02
Mean hours CME in osteoporosis in the past year (SD)	2.2 (1.8)	2.1 (1.9)	NS

CME, continuing medical education.

those who used densitometry had ordered a test in the 4 weeks preceding the survey. Urban physicians ordered the test more frequently (0.85 tests/week compared with 0.58 tests/week for rural physicians, $p=0.001$) as did physicians with densitometry available locally (0.83 tests/week compared with 0.49 tests/week for physicians without local access, $p=0.001$). There was no association between use of densitometry and physician's age, year of graduation, amount of continuing medical education in osteoporosis, or the proportion of postmenopausal women in their practice. However, the frequency of use of densitometry was positively correlated with physicians' reported confidence in the use of the test ($r=0.25$, $p=0.001$). In comparison with rural physicians, urban physicians were more confident in the use of bone densitometry (mean score 7.2/10, compared with 6.7/10 for rural physicians, $p=0.004$) and

referred a greater proportion of their osteoporosis patients to a specialist (25.7% vs 22.7%, $p=0.02$).

Reported Indications for the Use of Densitometry

The indications for which physicians ordered bone density tests are summarized in Table 3. The most commonly cited reasons for ordering densitometry were: (1) the patient had risk factors for osteoporosis (79.4%); (2) to aid decision-making about HRT (77.5%); (3) patient request (56.2%); and (4) follow-up of treatment (56.0%). The incidental finding of osteopenia on a radiograph was identified as an additional indication for densitometry. When asked to rank these indications for densitometry, risk factors for osteoporosis and decision-making about HRT were ranked equally as the most

Table 3. Physician-reported indications for bone densitometry

Indication for bone density testing	Percent of physicians who ordered a bone density test for each indication					
	Urban (n = 208)	Rural (n = 249)	p value	Female (n = 192)	Male (n = 265)	p value
Patient had risk factors for osteoporosis	81.7	77.5	$p = 0.03$	84.9	75.8	$p = 0.02$
To aid in HRT decision-making	82.2	73.5		86.5	70.8	$p = 0.001$
Patient request	61.1	52.2		57.3	57.3	
Follow-up	60.1	52.6		65.6	48.7	$p = 0.001$
Patient had a recent fracture	43.8	45.8		48.4	42.4	
Patient had height loss	23.1	25.7		31.2	19.7	$p = 0.005$
Patient had back pain	16.3	22.9		17.7	21.6	

frequent reasons for ordering densitometry, followed by patient request and follow-up. Rural (but not urban) physicians ranked recent fracture equally with follow-up as a reason for testing.

Reported Limitations to the Use of Densitometry

Respondents identified several factors limiting their use of densitometry; 24% of urban and 33% of rural physicians identified at least one such factor ($p=0.04$) (Table 4). Limitations included the distance to the nearest densitometry facility (rural: 17.6%, urban: 4.9%, $p=0.0001$) and the cost of the test (rural: 14.2%, urban: 12.9%, $p=NS$). Physicians who identified limiting factors ordered bone density testing less frequently ($p=0.0001$).

Gender Comparisons in the Use of Densitometry

In comparison with male physicians, female physicians were younger (mean age 38.0 years vs 42.3 years for male respondents, $p=0.001$), had graduated more recently (mean years since graduation was 10.2 for women and 14.4 for men, $p=0.001$) and had a greater proportion of postmenopausal women in their practice (20.8% vs 17.9%, $p=0.003$). Furthermore, female

physicians were more confident in the use of densitometry (score 7.2/10 vs 6.7/10, $p=0.02$) and ordered more tests (0.81/week vs 0.65/week, $p=0.03$), even after adjusting for the proportion of postmenopausal women in their practice. A greater proportion of female physicians used densitometry to aid in HRT decision-making (86.5% vs 70.8%, $p=0.001$), and they identified this as the most frequent reason for ordering the test (Table 3), unlike their male colleagues, for whom the most highly ranked reason for using densitometry was that the patient had risk factors for osteoporosis ($p=0.02$).

Physician Opinions about Densitometry Reporting

Most physicians received test results in the form of a written report plus the scan printout, with 12% indicating that they receive only a written report. The features of the bone density report perceived to be most useful were the statement of fracture risk, the comparison of bone density with that of age-matched controls, and suggestions for investigation and management (Table 5). Respondents also indicated that the graphical representation of the bone density results were helpful in discussing test results with patients. The components of the report perceived to be least useful were bone density in grams per square centimeter and both the T -

Table 4. Limitations to the use of bone densitometry

Potential limitation	Percent of physicians who responded 'extremely limiting' or 'very limiting'		
	Urban ($n = 208$)	Rural ($n = 249$)	Total ($n = 457$)
Test too expensive	12.9	14.2	13.6
Nearest facility is too far away	4.9	17.6	11.8*
Results of the test do not help my patient management	4.9	6.6	5.8
Difficult to get a booking	4.9	5.9	5.4
Uncertain regarding the value of the test	2.5	6.7	4.7 [†]
Difficult to interpret test results	3.9	3.3	3.6

* $p = 0.005$, [†] $p = 0.0001$.

Table 5. Physicians' opinions regarding components of the bone density report

Component of bone density report	Percent of physicians who responded 'extremely helpful' or 'very helpful'			
	Urban ($n = 208$)	Rural ($n = 249$)	Female ($n = 192$)	Male ($n = 265$)
Fracture risk	79.5	80.9	7.3	74.8*
BMD: % age-matched controls	74.7	68.0	73.2	69.7
Suggestions for investigation	53.1	55.6	59.4	50.4
Suggestions for management	55.8	52.9	61.0	49.1
Suggestions for timing of follow-up densitometry	53.4	55.2	58.5	49.3 [†]
BMD: % young adult controls	47.3	33.3*	44.9	36.0
BMD: Z-score	30.8	22.5	29.2	24.4
BMD: T-score	27.8	19.1	23.6	23.1
BMD in g/cm ²	12.5	10.6	7.8	14.5

* $p = 0.001$, [†] $p = 0.009$.

and Z-scores. Female physicians were significantly more likely to find the reporting of fracture risk and suggestions for management helpful. Urban physicians were more likely than rural physicians to find the comparison with young adults helpful.

Discussion

This survey of Ontario family physicians (the first to examine the use of densitometry by Canadian physicians) indicates that bone densitometry is being used extensively in primary care, with only a small proportion of physicians indicating that their use of densitometry is limited. The only significant limitations to use that were identified by more than 10% of respondents were travel distance and concerns regarding the cost of the test (particularly in the context of universal screening for osteoporosis). As would be expected, physicians who indicated that their use of densitometry was limited ordered significantly fewer bone density tests than their colleagues with 'unlimited access'. The only other published study on physician use of densitometry is a survey of physicians at a single community hospital in Rochester, New York in 1994 [14]. In that study, densitometry was used by only 28% of respondents, with only 5% ordering more than five tests annually, while in our study, 96% of respondents used densitometry, most on a regular basis. The Rochester physicians reported that in addition to limited access and cost (which were also identified in our study), uncertainty regarding the utility of the test and the guidelines for its use limited densitometry use. Forty percent of physicians in the 1994 study were uncertain about the utility of the test, compared with less than 5% in our study. However, since 1994, guidelines for the use of bone densitometry have been more widely disseminated [3–5], and there has been a dramatic increase in availability of densitometry across North America; it is difficult to make comparisons between 1994 and 1998, other than to suggest that the changes reflect the increased access to, and understanding of, bone densitometry.

There is limited additional information on densitometry use from reviews of referral patterns to densitometry facilities. Data from a 1991 British study

[15] and the 1996 U.S. randomized trial of bone density reporting [11] both identified risk factors for osteoporosis (including early menopause, family history of osteoporosis, medical conditions and steroid use) as the most common indication for densitometry. Other reasons were consideration of HRT, history of fracture, patient request and back pain. Our results are consistent with these findings; Ontario family physicians are similarly using bone densitometry primarily to screen for osteoporosis in individuals with risk factors and to aid in HRT decision-making. This is consistent with the guidelines for the use of bone densitometry (Table 6) that were published in the consensus statement from the Scientific Advisory Board of the Osteoporosis Society of Canada in 1996 [5]. Less frequent use of densitometry for late indicators of disease such as back pain and fracture suggests that family physicians are looking beyond osteoporosis treatment, and are focusing on strategies for osteoporosis prevention.

Female respondents use densitometry more often than their male colleagues, and specifically use it more frequently to guide HRT decision-making. This is consistent with other studies that have examined gender differences in the provision of preventive care [16–18]. Female physicians have been found to screen more aggressively for breast and cervical cancer, and for hypercholesterolemia, even after adjusting for patient variables known to influence screening decisions [17]. Women who have female physicians have not been found to be more prevention oriented than other women [18] and, in this study, use of densitometry because of 'patient request' was the same for male and female physicians. However, it is not possible to comment on gender differences in the appropriateness of densitometry use. The increased use of densitometry by female physicians may represent overscreening, as has been suggested by data from cancer screening studies [17], and this needs to be addressed in future studies.

When asked about bone density reporting, respondents indicated that bone mineral density reported in grams per square centimeter or the *T*- and *Z*-scores (all of which are routinely reported) were not helpful to them in patient management. It is not known whether or not they fully understand the *T*- and *Z*-scores; the survey did not attempt to investigate this issue. Fracture risk was identified as the most helpful feature of the bone density report, followed by a comparison of BMD with that of age-matched controls. The other components of the report that were highly rated were all related to patient care: suggestions for investigation, management, and the timing of follow-up densitometry. One study examined the preferences of Arizona primary care physicians with respect to bone densitometry reporting. In contrast to our study, relative fracture risk, *T*- and *Z*-scores, BMD and the WHO definition of normal BMD were identified as the most useful components of the report, while recommendations regarding treatment and follow-up were less important [10]. However, a randomized controlled trial in which physicians were randomised to receive either short technical reports or longer clinical

Table 6. Indications for bone mass measurement [5]

Bone density tests are clearly indicated for the following reasons:

- Menopause
- Amenorrhea in a younger woman for any reason
- Prolonged treatment (for more than 3 months) with supraphysiologic doses of glucocorticoids
- Asymptomatic, mild, primary hyperparathyroidism
- A strong family history of osteoporosis, or the presence of other risk factors for osteoporosis

Bone density tests are also clearly indicated when:

- A diagnosis of osteopenia on the strength of a radiologist's interpretation of an x-ray must be confirmed or denied
 - A patient has started osteoporosis therapy and the physician wishes to determine whether the treatment has been effective
-

reports found that the physicians preferred reports that contained treatment and follow-up recommendations [11]. In this study, clinical reporting resulted in a trend toward increased investigation of secondary causes of osteoporosis, adjustment of pharmacologic therapy and fewer referrals to specialists for osteoporosis management. This has implications for the reporting of bone densitometry, since this type of reporting requires some expertise in osteoporosis. Currently there are no formal requirements for either training or certifying physicians who report bone densitometry. In addition, manufacturer-supplied computerized reporting systems currently cannot provide a clinical interpretation, and these systems are being used with increased frequency. Our results suggest a need for physician training in bone density reporting and for standardized reporting of test results which incorporates management recommendations.

This study has several potential limitations. First, bone densitometry is far more available in Ontario than in other Canadian provinces, and the number of facilities has increased dramatically over the past few years. Our results suggest that few Ontario physicians are significantly limited in their use of bone densitometry. At the time of this survey there were more bone densitometry facilities in Ontario (88) than existed in the remainder of Canada (Osteoporosis Society of Canada, personal communication) and the use of densitometry in Ontario is unlikely to be representative of its use across Canada. However, where densitometry is available, physicians appear to be following the guidelines for its use. Furthermore, although the opinions of Ontario physicians regarding reporting may not be generalizable to physicians who have limited access to bone densitometry, they are likely representative of opinions in regions across North America where bone densitometry is readily available. Where access to densitometry is limited, many individuals with osteoporosis may not be diagnosed until they fracture. It is of note that recent fracture was more highly ranked as an indication for ordering densitometry both by physicians who indicated that access was limited, and by rural physicians in general. Second, members of the College of Family Physicians of Canada may not be representative of all primary care physicians practicing in Ontario, and this difference has been investigated. Based on chart review, members have been found to provide a higher level of preventive care than nonmembers [19]. Members also have continuing medical education obligations to meet their annual recertification requirements. For these reasons, the findings of this survey may overestimate the level of awareness of family physicians concerning the use of bone densitometry in the diagnosis and management of osteoporosis. Third, our results rely on self-report, and may therefore not be truly representative of actual practice. Finally, physicians who chose to complete the questionnaire may have had more definite opinions about densitometry (either for or against) than non-responders.

In conclusion, in a region where bone densitometry is generally available, family physicians appear to be following published guidelines for its use. Bone density reporting is currently quite variable. Our results complement those of a previous randomized trial of bone density reporting and support the consensus statement of the International Panel of the Clinical Utility of Bone Mass Measurements with respect to primary care physicians, which states that bone mass measurement should be accompanied by a clinical interpretation [9]. Our results suggest that this type of reporting is well received by family physicians who are managing patients with osteoporosis. Bone density reporting that incorporates clinical data may result in both improved management of patients with osteoporosis, and more appropriate use of bone densitometry, and this needs to be investigated.

Acknowledgements. This work was supported by a grant from the Women's College Hospital Department of Medicine Research Fund. G.A.H. is a Scholar of the Medical Research Council of Canada. Portions of this paper were previously presented in poster sessions at ASBMR-IBMS, San Francisco, December 1998. We would like to thank Eng Tingchaleun and Maria Ricupero for their assistance with the study.

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*Received for publication 26 May 1999
Accepted in revised form 19 September 1999*