

Family Physicians' Personal and Practice Characteristics that Are Associated with Improved Utilization of Bone Mineral Density Testing and Osteoporosis Medication Prescribing

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Abstract

Family physicians' personal and practice characteristics may influence how osteoporosis is managed. Thus, we evaluated the impact of family physicians' personal and practice characteristics on the appropriate use of bone mineral density testing and osteoporosis therapy.

The physician questionnaire assessed 13 personal and practice characteristics of the physicians. The patient questionnaire was used to collect data to ascertain how family physicians managed osteoporosis. A total of 225 family physicians from 7 provinces across Canada completed both the physician and patient questionnaires. The family physicians evaluated a total of 5601 patients. The generalized estimating equations technique was utilized to model the associations between family physicians' personal and practice characteristics and appropriate use of bone mineral density

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testing and osteoporosis therapy. Odds ratios (OR) and corresponding 95% confidence intervals (CI) are reported.

Findings indicated that female family physicians have higher odds of administering appropriate bone density testing compared to male family physicians (OR: 1.28; 95% CI: 1.05, 1.55), and that physicians who have hospital privileges (OR: 0.77; 95% CI: 0.62, 0.97) and who graduated more recently from medical school (OR: 0.87; 95% CI: 0.77, 0.99) have lower odds of administering appropriate bone mineral density tests. Physicians who use electronic health records have higher odds of administering appropriate therapy (OR: 1.30; 95% CI: 1.06, 1.59) as compared to physicians who do not use them.

Several family physicians' personal and practice characteristics are associated with appropriate utilization of bone mineral density testing and therapy. The education of both clinicians and policy makers regarding these new insights may translate to enhanced individual practices and an improved overall health care system to optimize the environment for managing osteoporosis.

Introduction

Osteoporosis, the most common metabolic bone disease in the elderly, is a chronic and progressive condition that leads to low bone mass and skeletal fragility. The most common sites of osteoporotic fracture occur at the hip, spine, and wrist, but almost any bone can fracture as a result of increased bone fragility.^{1,2} The major complications of fracture include reduced health-related quality of life and increased institutionalization, length of hospital stay, health care costs, and mortality.³⁻⁷

In Canada, roughly 1 in 4 women have osteoporosis.⁸ According to estimates, a 50-year-old white woman has a 40% chance of developing a hip, vertebral, or wrist fracture in her remaining lifetime.^{1,2} Furthermore, the incidence of osteoporosis is expected to rise sharply over the next several decades because 25% of the population will be 65 years of age or older by 2041.⁹ Thus, it is important that family physicians identify patients at risk for developing osteoporosis so as to properly manage their care.

To guide physicians in managing the disease, Osteoporosis Canada has developed and circulated the 2002 Clinical Practice Guidelines for the Management of Osteoporosis.¹⁰ The guidelines recommend evidence-based procedures for identifying and evaluating those at risk for fracture, the use of bone mineral density testing to diagnose patients and assess individual responses to therapy, and the appropriate selection of pharmacologic therapy for the prevention and treatment of the disease. Nonetheless, even with guidelines, it has been demonstrated that there is a care gap in managing patients in everyday clinical settings.¹¹⁻¹³

Many potential barriers may impact this diagnostic and therapeutic care gap. Several of these barriers may be related to family physicians' personal and practice characteristics. For example, it has been found that these characteristics have influenced the management of many other medical conditions.¹⁴⁻²⁰ The length of time spent with a patient has been shown to differ between male and female physicians, with female physicians spending significantly more time with their patients as compared to their male counterparts.¹⁶⁻¹⁹ Results from studies of electronic medical record utilization have proven considerable reductions in

medical errors and unnecessary testing.^{16–19} Furthermore, group or team practice may result in time savings, thus allowing for the family physician to conduct more thorough patient examinations, and resulting in fewer unwarranted tests and referrals.²⁰

Using data from the Canadian Quality Circle Project,²¹ which is a multifaceted integrated disease management approach, we evaluated the impact of family physicians' personal and practice characteristics on patient care involving osteoporosis. Once the barriers are identified, the education of clinicians and policy makers will help improve the overall health care system to optimize the environment for managing osteoporosis.

Methods

These analyses are part of a larger trial, the Canadian Quality Circle Project.²¹ Briefly, the project was designed to gather, analyze, and distribute data on physician practices in the diagnosis and treatment of osteoporosis so that the deficiencies may be recognized and beneficial procedures may be put into practice through quality circles (ie, small group meetings), a multifaceted osteoporosis educational intervention strategy. The aims of the study were to examine whether the use of quality circles can improve family physicians' practices for managing osteoporosis; to identify barriers in clinical practice to optimize diagnosis and treatment of osteoporosis; and to recognize, develop, and apply care strategies to address these barriers. At the start of the study, each family physician gathered patient data from his or her practice, using a standardized data collection form, to determine current practice patterns for diagnosing and treating osteoporosis.

Physician selection

Family physicians were recruited from several geographical regions across Canada. All physicians were given an introductory letter that detailed the study methods and objectives, and all were asked to participate. All participating physicians gave written informed consent. Physicians were recruited because of their interest in osteoporosis. For the current analysis, all family physicians had to have completed the physician questionnaire. The study was approved by a central health research ethics board for British Columbia, Saskatchewan, Manitoba, Ontario, Quebec, and the Atlantic Provinces, and by a research ethics board at the College of Physicians and Surgeons of Alberta for the Province of Alberta.

Measurements

Two questionnaires were evaluated to determine the influence of family physicians' personal and practice characteristics on how they managed osteoporosis in patients within their own practices. Both questionnaires were completed by the individual family physicians. All completed questionnaires were faxed to a central site where all the information was incorporated in an electronic database for analysis.

Physician Questionnaire—The physician questionnaire assessed 13 personal and practice characteristics of the physicians including: 1) sex (male/female); 2) year of graduation from medical school; 3) country of medical school (Canada/Other); 4) a description of the clinical work involved including whether the physician has a full- or part-

time practice, has hospital privileges (yes/no), provides house calls (yes/no), or has after-hours call coverage for a defined group of patients (yes/no); 5) a description of the type of practice including whether the physician works in a solo or group practice, works in a teaching practice (yes/no), is involved with an interdisciplinary team on site (yes/no), uses electronic health records (yes/no), or mainly uses fee-for-service billings (yes/no); and 6) whether the physician is a current member of the College of Family Physicians of Canada (yes/no).

Patient Questionnaire—The patient questionnaire was utilized to collect data to ascertain how family physicians managed osteoporosis including risk factor identification, bone mineral density testing, and therapies. The standardized patient questionnaire was completed for 25 patients in each physician practice. The physicians' practice patterns were then compared to the Osteoporosis Canada guidelines.¹⁰

Eligible patients were enrolled based on the following criteria: women 55 years of age and older, who were known to the clinician, and who had at least 2 appointments in the 24 months before enrollment. The screening methods for choosing eligible patients were carried out by the clinic nurse to circumvent the potential for physician bias. At the end of each recruitment day, the clinic nurse used the day's visit schedule to randomly select the medical charts of 3 or 4 patients who met the eligibility criteria of the study. After making the selection, the clinic nurse inserted the patient questionnaire into each patient chart and the physician completed the form. For the current analysis, the patient questionnaires were completed prior to the start of the family physicians' educational interventions that were part of the larger Canadian Quality Circle Project.

Osteoporosis Canada Guideline Recommendations

According to the Osteoporosis Canada 2002 guidelines, for all postmenopausal women younger than age 65, a bone mineral density measurement is recommended for those who have at least 1 major or 2 minor risk factors for future fracture. In addition, all women 65 and older should have a bone mineral density test conducted. The guidelines also recommend that a patient should be given osteoporosis therapy (including either alendronate, calcitonin, etidronate, hormone replacement therapy, parathyroid hormone, raloxifene, or risedronate) if the patient has at least 1 of the following: a fracture and a bone density test result is pending, osteopenia and prior fragility fracture, osteopenia and at least 1 major (excluding prior fracture) or 2 minor risk factors for future fracture, or osteoporosis defined as a bone mineral density t-score of less than -2.5 regardless of risk factor status.¹¹

Statistical analysis

The generalized estimating equations²² technique assuming an exchangeable correlation structure was utilized to model the associations between family physicians' personal and practice characteristics and the appropriate use of bone mineral density testing and osteoporosis therapy. The generalized estimating equations method was conducted to take into account the clustered nature of the data, given that patients treated within a family physician's practice should be correlated (clustered variable is the physician). For the model, the unit of analysis is the patient and the unit of inference is the family physician. Univariate

(crude) and multivariable analyses (all 13 family physicians' personal and practice characteristics) were conducted for each of the 2 dependent variables (appropriate bone mineral density testing and appropriate osteoporosis therapy). For both analyses, the sex variable was interacted (2-way interactions) with all other family physicians' personal and practice characteristics. No significant 2-way interactions were found and thus they were not included in the final multivariable models. Unadjusted and adjusted odds ratios (OR) and corresponding 95% confidence intervals (CI) are reported.

The OR is a measure of the strength of a relationship and is a way of comparing whether the probability of a certain event is the same for 2 groups. These groups may be men and women, or any other dichotomous variable. An OR greater than 1 implies that the event is more likely in the first group (the non-reference group), whereas an OR less than 1 implies that the event is less likely in the first group.

The 2 dependent variables were based on the Osteoporosis Canada guidelines and were defined as follows: appropriate bone mineral density testing (yes/no) occurs when a test is ordered for patients who have at least 1 major or 2 minor risk factors for future fracture (high risk), or is not ordered for patients who have only 1 minor or no risk factors. Appropriate therapy (yes/no) is given if the patient has a prior fracture and a bone density test result is pending; if the patient has either osteopenia and prior fragility fracture, or osteopenia and at least 1 major (excluding prior fracture) or 2 minor risk factors for future fracture; or the patient has osteoporosis defined as a bone mineral density t-score of less than -2.5 regardless of risk factor status; or when therapy is not administered to patients without bone mineral tests or normal bone density measurements (t-score >-1), regardless of other major or minor risk factors; or if the patient has osteopenia and only 1 minor or no risk factors for future fracture.

Goodness of fit of each multivariable model was assessed using the method developed by Horton et al.²³ All statistical analyses were performed using the SAS/STAT (version 9.1; SAS Institute Inc., Cary, North Carolina, USA) software package running on Windows XP Professional. The criterion for statistical significance was set at $\alpha = 0.05$.

Results

A total of 225 family physicians from 7 provinces across Canada (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and the Atlantic Provinces) completed both the physician and patient questionnaires. Of the 225 family physicians, 48% (108/225) were men. At the start of the study, male and female family physicians had graduated from medical school approximately 28 and 22 years prior to enrollment, respectively. The calendar year (median) of graduation from medical school was 1977 and 1983 for male and female physicians, respectively. Most family physicians worked full time and in a group practice. Approximately 20% of family physicians used electronic health records in their practices (Table 1).

The family physicians evaluated a total of 5601 patients. A majority of patients were 65 years of age and older (63%); 10.7% of patients had a prior fracture at the hip, wrist, or

spine; and 66.7% of patients had a bone mineral density test (Table 2). A total of 1698 patients were taking bisphosphonates, 294 patients were taking hormone replacement therapy, 100 patients were taking raloxifene, 58 patients were taking calcitonin, and 3 patients were taking parathyroid hormone.

Appropriate bone mineral density testing

Table 3 summarizes the unadjusted and adjusted ORs and 95% CI among all 13 family physicians' personal and practice characteristics and appropriate bone mineral density testing. Unadjusted results suggest that female family physicians have higher odds of administering appropriate bone mineral density tests compared to male family physicians (OR: 1.23; 95% CI: 1.03, 1.46) and that physicians who have hospital privileges have lower odds of administering appropriate bone mineral density tests (OR: 0.74; 95% CI: 0.61, 0.90). Similar ORs for physician sex (OR: 1.28; 95% CI: 1.05, 1.55) and physicians who have hospital privileges (OR: 0.77; 95% CI: 0.62, 0.97) were observed for the adjusted results. In addition, adjusted results showed that physicians who graduated more recently from medical school (OR: 0.87; 95% CI: 0.77, 0.99) have lower odds of administering appropriate bone mineral density testing. The goodness of fit test for the adjusted analysis showed adequate fit ($P = 0.27$).

Appropriate therapy administration

Results revealed that family physicians who use electronic health records have higher odds of administering appropriate therapy (unadjusted results = OR 1.24; 95% CI: 1.01, 1.53; adjusted results = OR 1.30; 95% CI: 1.06, 1.59) as compared to physicians who do not use these records. No other characteristics were found to be significantly related to appropriate therapy administration (Table 4). The goodness of fit test for the adjusted analysis showed adequate fit ($P = 0.56$).

Discussion

In contrast to other medical conditions, osteoporosis can be identified early during the course of the disease by diagnostic tests. Effective diagnosis of osteoporosis must include bone mineral density testing, which is a reliable method for predicting fracture risk. Low bone mineral density has been found to be a major risk factor for fracture in postmenopausal women.^{10,24} Treatment should be initiated after a patient has been diagnosed with having a high risk for developing a future fracture, given that there are many proven modern pharmacological therapies for the prevention and treatment of osteoporosis.¹⁰ However, for several reasons, osteoporosis is underdiagnosed and undertreated. Family physicians may have a tendency to overlook the impact of osteoporosis given that individuals with osteoporosis are asymptomatic (other than fracture) and may instead focus on acute or other chronic conditions that they consider to be more serious or life threatening. In addition, other barriers to optimal patient care may be related to family physicians' personal and practice characteristics.

The interest in the associations between physician characteristics and health care management has increased with the higher number of women entering medicine. In 2000,

women comprised roughly 46% of new applicants entering medical schools in the United States, and a large number of women enrolled in primary care areas.²⁵ Our results revealed that female family physicians are more likely to order appropriate bone mineral density tests for their patients as compared with male family physicians. Other studies have shown gender differences in how physicians communicate and manage patients. For example, patients of female physicians are more likely to be given preventive tests, such as breast and pelvic assessments, Pap smears, mammograms, rectal exams, and blood pressure readings as compared to patients of male physicians.^{26–30} Moreover, there are data highlighting important differences in the way female and male physicians converse with their patients.^{14,15} Female physicians' communication styles result in more positive discussion, partnership building, questioning, and information gathering regarding biomedical and psychosocial issues as compared with male physicians. Female physicians also dedicate more time and energy to discussing the patient's family and social concerns and are less controlling in their communication methods.²⁶ In addition, female physicians have significantly longer visits with their female patients than male physicians have with female patients. Given these gender differences, it is important that student physicians be made aware of these differences during their training and that communication courses be provided.

A physician's gender may affect the physician-patient relationship and patient management in a number of ways. For example, female physicians may order more appropriate bone mineral density tests because they are more sensitive to and conscious of female preventive medicine due to their own feelings of vulnerability to osteoporosis. This hypothesis has been verified in cancer trials.^{27,31} Furthermore, female physicians may relate better to female patients because of the tendency of physicians to manage greater numbers of patients of their own sex.^{32,33} Finally, patients may have different expectations of their physician based on the physician's sex. For instance, they might believe that female physicians are more helpful and compassionate, and thus, patients may provide more relevant information to these clinicians.³⁴

Our study also demonstrated that appropriate bone mineral density testing is influenced by a physician's experience. This is not surprising, and other investigators have confirmed these findings for other medical conditions.^{35–40} For example, Howard et al showed that physicians with less experience are more likely to conduct unsuccessful lumbar punctures in children receiving intrathecal chemotherapy as compared with more experienced physicians.³⁵ In addition, there is a positive relationship between physician experience and patient survival in diseases such as HIV/AIDS and tuberculosis.^{36–38} Finally, studies have demonstrated a positive relationship between increased numbers of surgical procedures and patient health outcomes.^{39–40}

Our study revealed that physicians with hospital privileges were less likely to provide appropriate bone mineral density testing as compared to physicians without these privileges. It is possible that family physicians with hospital privileges are more focused on acute care outcomes (such as surgery) and as a consequence, they fail to recognize the long-term chronic complications of osteoporosis. However, while the majority of family physicians evaluated in the current study had hospital privileges, data are lacking regarding whether physicians used these privileges, how much time physicians spent in hospitals, and their role

in patient care at hospitals. Studies have found that, with the exception of obstetrics, fewer than 40% of physicians used their privileges.⁴¹ Thus, it is impossible to draw any conclusions regarding the association between a physician's hospital privileges and the appropriate use of bone mineral density testing given that many important variables were not included in the analysis. As such, these results should not be interpreted without further research.

Physicians who utilized electronic health records in their practices demonstrated greater odds of administering osteoporosis therapy appropriately. Electronic medical record systems may offer considerable advantages to physicians, their practices, and patient health outcomes. Trials of electronic medical record programs with decision-support algorithms have found sizable benefits to the health care system by reducing medical errors, pharmacy costs, adverse drug reactions, needless radiology and laboratory testing, and unnecessary hospital admissions.⁴²⁻⁴⁷ Furthermore, the use of electronic records may improve the physician's time management. With more free time, family physicians may be able to perform more thorough patient examinations resulting in fewer unnecessary tests and referrals. In general, these systems can facilitate physician workflow and enhance patient management and safety.¹⁷

This national study has several advantages. For example, the project selected a large number of family physicians from across Canada who evaluated over 5000 patients' charts from their own practices, which will improve the generalizability of our study results. Furthermore, the patient chart audits were selected randomly and did not rely on physicians self-report, which may reflect attitudes about their practice rather than true practice. In addition, we examined several potential family physicians' personal and practice characteristics that may be associated with appropriate utilization of bone mineral density testing and osteoporosis therapy. The evaluation of these characteristics is essential to unravel the effect of individual factors on appropriate physician management.

Nonetheless, our study has some limitations. All patients examined in our study were postmenopausal women and, as a consequence, the associations between family physicians' characteristics and appropriate management may differ in male or premenopausal women patients. Furthermore, given that physician recruitment was based on the clinician's interest in osteoporosis and women's health, these physicians may be more experienced and comfortable with managing the disease from the onset. Moreover, the clinicians who were enrolled in the study were from urban areas and prior research has indicated that these physicians order more bone density measurements as compared with rural physicians.⁴⁸ Finally, it is essential to consider that Osteoporosis Canada practice guidelines were designed to offer physicians a summary of the best evidence from clinical trials to guide them to make health care choices relating to osteoporosis; nonetheless, clinical judgment and the patient's preference will determine if, when, and what preventive procedures and treatments will be used. Thus, 100% compliance with the guidelines is not realistic or warranted.

In conclusion, family physicians have a distinct opportunity to manage patients with osteoporosis; they examine their patients on a regular basis, they are a convincing source of

health information for their patients, they treat their osteoporosis patients for other health problems, and they are positive and eager to manage patients with osteoporosis. As a result, physicians should strive to provide optimal care for their patients.

Several family physicians' personal and practice characteristics are associated with appropriate utilization of bone mineral density testing and therapy, including physicians' sex and experience, and whether a physician has hospital privileges or uses electronic health records. These findings should provide new insights and educational opportunities for clinicians and policy makers to better arrange individual practices and the overall health care system to optimize the environment for managing osteoporosis.

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Table 1Physician Personal and Practice Characteristics (*n* = 225)

	Combined <i>n</i> (%)	Men <i>n</i> (%)	Women <i>n</i> (%)
Country of Medical School			
Canada	201 (89.3)	92 (85.2)	109 (93.2)
Description of Work (yes)			
Full-time practice	213 (94.7)	104 (96.3)	109 (93.2)
Hospital privileges	154 (69.1)	79 (73.2)	75 (65.2)
House calls	132 (61.1)	69 (65.7)	63 (56.8)
Provides after-hours call coverage	156 (71.6)	78 (72.9)	78 (70.3)
Type of Practice (yes)			
Group	160 (71.1)	71 (65.7)	89 (76.1)
Teaching practice	67 (30.0)	32 (29.9)	35 (30.2)
Works with interdisciplinary team	73 (32.7)	35 (32.4)	38 (33.0)
Use of electronic health records	45 (20.1)	22 (20.4)	23 (19.8)
Medical practice income mainly generated from fee-for-service billing	192 (85.3)	92 (85.2)	100 (85.5)
Current member of College of Family Physicians of Canada	123 (54.7)	55 (50.9)	68 (58.1)
Year of graduation from medical school: median (interquartile range)	1981 (11)	1977 (10)	1983 (9)

Table 2Patient Characteristics (*n* = 5601)

	<i>n</i> (%)
Risk factors for fracture	
Age ≥ 65 yrs	3508 (63.0)
Prior hip fracture *	92 (1.6)
Prior wrist fracture *	228 (4.1)
Prior vertebral fracture *	348 (6.2)
High risk for BMD test	4250 (75.9)
BMD testing	
No test	1871 (33.4)
T-score: >−1	1019 (18.2)
T-score: −1 to −2.5	1362 (24.3)
T-score: <−2.5	1155 (20.6)
Test results pending	194 (3.5)
Appropriate BMD testing	3465 (61.9)
Therapy	
Number of patients on at least 1 therapy	2081 (37.2)
Appropriate therapy **	4407 (78.7)

BMD, bone mineral density.

* Patients may have had multiple fractures.

** Appropriate therapy (yes/no) is given if the patient has a prior fracture and bone density results are pending; if the patient has either osteopenia and prior fragility fracture, or osteopenia and at least 1 major (excluding prior fracture) or 2 minor risk factors for future fracture; or the patient has osteoporosis defined as a bone mineral density t-score of less than −2.5 regardless of risk factor status; or when therapy is not administered to patients without bone mineral tests or normal bone density measurements (t-score >−1), regardless of other major or minor risk factors, or if the patient has osteopenia and only 1 minor or no risk factors for future fracture.

Table 3

Family Physicians' Personal and Practice Characteristics that Influence Appropriate Bone Mineral Density Testing: Odds Ratios and 95% Confidence Intervals

	Crude	Adjusted*
Physician		
Sex (women)	1.23 (1.03, 1.46)	1.28 (1.05, 1.55)
Current member of College of Family Physicians of Canada	0.99 (0.83, 1.19)	0.98 (0.79, 1.20)
Year of graduation from medical school (10 year increase)	0.90 (0.80, 1.00)	0.87 (0.77, 0.99)
Country of Medical School		
Canada	0.88 (0.67, 1.17)	0.89 (0.67, 1.17)
Description of Work (yes)		
Full-time practice	0.78 (0.47, 1.28)	0.76 (0.49, 1.20)
Hospital privileges	0.74 (0.61, 0.90)	0.77 (0.62, 0.97)
House calls	0.88 (0.73, 1.08)	0.91 (0.75, 1.10)
Provides after-hours call coverage	0.85 (0.71, 1.02)	0.85 (0.69, 1.05)
Type of Practice (yes)		
Group	0.97 (0.80, 1.19)	1.07 (0.87, 1.31)
Teaching practice	0.99 (0.82, 1.22)	1.06 (0.85, 1.32)
Works with interdisciplinary team	1.04 (0.85, 1.28)	1.05 (0.83, 1.32)
Use of electronic health records	1.01 (0.82, 1.26)	1.02 (0.81, 1.29)
Medical practice income mainly generated from fee-for-service billing	0.82 (0.62, 1.07)	0.76 (0.57, 1.03)

* Personal and practice characteristics of the physicians that were adjusted for in the analysis include sex, year of graduation from medical school, country of medical school, full- or part-time practice, hospital privileges, provides house calls, has after-hours call coverage for a defined group of patients, solo or group practice, works in a teaching practice, is involved with an interdisciplinary team on site, uses electronic health records, uses fee-for-service billing, and has current membership in the College of Family Physicians of Canada.

Table 4

Family Physicians' Personal and Practice Characteristics that Influence Appropriate Therapy in Patients: Odds Ratios and 95% Confidence Intervals

	Crude	Adjusted*
Physician		
Sex (women)	0.92 (0.78, 1.09)	0.92 (0.79, 1.08)
Current member of College of Family Physicians of Canada	1.06 (0.90, 1.25)	1.07 (0.87, 1.31)
Year of graduation from medical school (10 year increase)	0.96 (0.86, 1.09)	0.98 (0.87, 1.11)
Country of Medical School		
Canada	0.94 (0.71, 1.25)	0.93 (0.67, 1.27)
Description of Work (yes)		
Full-time practice	1.12 (0.69, 1.84)	1.33 (0.84, 2.11)
Hospital privileges	0.92 (0.76, 1.11)	0.84 (0.67, 1.05)
House calls	0.93 (0.77, 1.11)	0.93 (0.76, 1.12)
Provides after-hours call coverage	1.07 (0.88, 1.28)	1.11 (0.89, 1.37)
Type of Practice (yes)		
Group	0.93 (0.77, 1.12)	0.90 (0.74, 1.09)
Teaching practice	0.93 (0.78, 1.11)	0.94 (0.77, 1.15)
Works with interdisciplinary team	0.96 (0.80, 1.14)	1.10 (0.86, 1.40)
Use of electronic health records	1.24 (1.01, 1.53)	1.30 (1.06, 1.59)
Medical practice income mainly generated from fee-for-service billing	1.20 (0.99, 1.45)	1.26 (0.98, 1.62)

* Personal and practice characteristics of the physicians that were adjusted for in the analysis include sex, year of graduation from medical school, country of medical school, full- or part-time practice, hospital privileges, provides house calls, has after-hours call coverage for a defined group of patients, solo or group practice, works in a teaching practice, is involved with an interdisciplinary team on site, uses electronic health records, uses fee-for-service billing, and has current membership in the College of Family Physicians of Canada.