Relation between physician characteristics and prescribing for elderly people in New Brunswick

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Objective: To determine whether there is a relation between physician characteristics and prescribing for elderly patients.

Design: Descriptive study linking two provincial databases.

Setting: New Brunswick.

Participants: All general practitioners (GPs) in New Brunswick who ordered at least 200 prescriptions for elderly beneficiaries of the New Brunswick Prescription Drug Program between Apr. 1, 1990, and Mar. 31, 1991; eligible GPs accounted for 376 (40%) of all physicians with a general licence in New Brunswick.

Main outcome measures: GPs' personal and professional characteristics (age, sex, family practice accreditation, country of training and number of years in practice), practice characteristics (number of practice days, number of patients seen and medical services provided per day, average amount of billing per patient, total number of patients seen and their average age, and total amount of billings) and number of prescriptions by category of drug.

Results: High prescribers and low prescribers did not differ significantly in age, number of years in practice, mean practice size or patient age. Compared with the low prescribers the high prescribers were more likely to be male, have been trained in Canada and be qualified by the Canadian College of Family Physicians. Also, they had more practice days, saw more patients per day, performed more services per day, billed more per patient and billed on average 30% more during the study period. Overall, the high prescribers ordered on average 45% more prescriptions than the low prescribers.

Conclusion: There is a significant relation between certain physician characteristics and prescribing behaviour. Further study is required to examine the relation between these variables and patient outcomes.

Objectif : Déterminer s'il y a un lien entre les caractéristiques des médecins et les ordonnances aux patients âgés.

Conception : Étude descriptive établissant un lien entre deux bases de données provinciales.

Contexte : Nouveau-Brunswick.

Participants : Tous les omnipraticiens (OP) du Nouveau-Brunswick qui ont produit au moins 200 ordonnances pour des bénéficiaires âgés du Programme des médicaments gratuits du Nouveau-Brunswick entre le 1er avril 1990 et le 31 mars 1991. Les OP admissibles représentaient 376 (40 %) des médecins titulaires d'une licence générale au Nouveau-Brunswick.

Principales mesures de résultats : Caractéristiques personnelles et professionnelles des OP (âge, sexe, agrément en médecine familiale, pays de formation et nombre d'années de pratique), caractéristiques de la pratique (nombre de jours de pratique, nombre de patients reçus et de services médicaux fournis par jour, montant moyen de la facturation par patient, nombre total de patients reçus et âge moyen de ceux-ci, et montant total des facturations), ainsi que nombre d'ordonnances par catégorie de médicaments.

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Résultats : Il n'y avait pas de différence importante quant à l'âge et au nombre d'années de pratique, à la taille moyenne de la pratique ou à l'âge des patients entre les médecins qui prescrivaient beaucoup et ceux qui prescrivaient peu. Par ailleurs, comparativement aux médecins qui prescrivaient peu, ceux qui prescrivaient beaucoup avaient plus de chance d'être de sexe masculin, d'avoir reçu leur formation au Canada et d'être agréés par le Collège canadien des médecins de famille. En outre, ils pratiquaient plus de jours, recevaient plus de patients par jour, exécutaient plus de services par jour, facturaient plus par patient et avaient facturé en moyenne 30 % de plus au cours de la période d'étude. Dans l'ensemble, les médecins qui prescrivaient beaucoup ont donné en moyenne 45 % de plus d'ordonnances que ceux qui prescrivaient peu.

Conclusion : Il y a un lien important entre certaines caractéristiques des médecins et leur comportement face aux ordonnances. Une étude plus poussée s'impose si l'on veut examiner le lien entre ces variables et les résultats chez les patients.

B etween 1950 and 1976, there was a fourfold increase in the rate of prescribing medications in the United States, without a similar increase in office visits.[1] This is reflected in part by the steady increase in the proportion of health care budgets consumed by drug benefit programs. For example, there was an annual increase in costs of 18.1% on average in the Ontario Drug Benefit Program over the last 10 years.[2] Since the introduction of the New Brunswick Prescription Drug Program (NBPDP), in 1975, costs to the program have increased by more than 700%, but the number of elderly beneficiaries has increased by only 16%. People 65 years of age and over consume approximately 60% of all prescription benefits. Increases in costs of individual drugs, numbers of available benefits and prescribing intensity account for this escalation in program costs.

The increased vulnerability of elderly people to adverse drug reactions is well documented. For example, people between the ages of 70 and 79 may be seven times more prone to the adverse effects of drugs than people between 20 and 29.[3,4] Several studies have attributed this to increasing age, altered pharmacokinetics and pharmacodynamics, multiple disease, poor compliance and polypharmacy.[5-7] However, geriatric prescribing knowledge is often inadequate, and inappropriate prescribing by physicians is common.[8-10] Drugs are frequently prescribed for social or other nonmedical reasons.[11-15] The Canada Health Survey identified elderly people as the largest consumer group of anxiolytics, sedatives and hypnotics and found that the prevalence of individuals whose duration of therapy exceeded the maximum allowable was high.[16] This finding was confirmed by the New Brunswick Department of Health and Community Service study on the utilization of benzodiazepines in elderly people.[17]

Canadian general practitioners (GPs) provide prescriptions for 21% to 86% of all patients seen in their office.[18] Few studies have clearly demonstrated how GPs' personal characteristics or practice conditions influence their prescribing behaviour. However, individual and professional characteristics and practice conditions that have been related to drug prescribing for elderly patients include physicians' age, sex, postgraduate education, exposure to continuing medical education programs, source of drug information and type of practice.[18-32] Large and significant variations in GPs' prescribing patterns have been found to depend on the type of practice or the community in which they prescribe.[33,34]

Nevertheless, the relation between GPs' practice and personal characteristics and their prescribing behaviour is still unclear. Data on this issue have been difficult to obtain. In this study we linked the database of the provincial drug benefit program for elderly people with that of the provincial medicare plan to examine how physician characteristics affect prescribing behaviour.

Methods

Two distinct databases were linked: those of the New Brunswick Medicare Program (NBMP) and the NBPDP. Data for Apr. 1, 1990, to Mar. 31, 1991, were included for analysis.

The NBMP database contained the records for all physicians' fee-for-service billings. Practice size was defined as the number of patients a practitioner saw and billed for during the study period. All GPs who ordered at least 200 prescriptions for elderly beneficiaries in the NBPDP (standard audit criteria for the NBPDP) during the study period were included; 376 (40%) of the GPs met this criterion. (Currently, 95% of total billings to the NBMP are submitted by approximately 500 GPs). Practitioners were reimbursed by the NBMP on a fee-for-service basis for all approved services.

The NBPDP database included specific information on each prescription dispensed, on a claim-by-claim basis. It held the records of every prescription dispensed to elderly patients residing outside of nursing homes during the study period. Data for each prescription dispensed included the date dispensed, the dispensing pharmacy, the prescribing physician, the drug, the dosage and quantity dispensed and the cost to the program.

All drugs dispensed were classified into 11 categories: antibiotics, antidepressants, antihypertensives, barbiturates, benzodiazepines, bronchodilators, cholesterol-lowering agents, gastrointestinal drugs, narcotics, neuroleptics and nonsteroidal anti-inflammatory drugs.

A weighing formula was developed *a priori* to calculate each GP's prescribing rate by category of drug

and the total number of drugs prescribed per patient relative to the other GPs. This formula accounted for the number and strength of each unit prescribed by each GP. The mean score for each category was unity. Values less than unity identified GPs who prescribed less than the mean (low prescribers). Values greater than unity identified those who prescribed more than the mean (high prescribers). The NBMP and NBPDP databases were linked using unique physician identification numbers. The identity of individual GPs was unknown to us. (Details of the weighing formula can be obtained from the corresponding author upon request.)

GPs were divided into two groups: high prescribers and low prescribers. Characteristics of the two groups were compared with the unpaired t-test for parametric data and the χ^2 test for frequency data. The linear relations between variables were determined with the Pearson r correlation, and significance was set at a p value of less than 0.01.

Results

Physician characteristics

All 376 GPs who met the inclusion criteria were successfully linked in the two databases. There were 312 male and 64 female physicians. The mean age of the sample was 43.2 (standard deviation [SD] 12.1) years.

Medicare billings

During the study period the GPs billed on average $145 547 (SD $73 471). Each GP practised 205 (SD 59.1) days and saw 2224 (SD 1134) patients. The mean number of visits per working day was 24.7 (SD 10.6).

Prescribing practices

There were 2 324 113 prescriptions dispensed through the NBPDP during the study period. Elderly patients outside of nursing homes accounted for 60% of the beneficiaries. The amount of drug dispensed was not to exceed a 100-day supply. Total billings to the NBPDP were over $57.8 million, of which approximately $36.6 million were for elderly patients. On average, each elderly beneficiary was dispensed 20.6 prescriptions (including refills). The average cost per elderly patient was approximately $490.

Drugs accounted for 68.0% of the costs, pharmacies received 29.7%, and administration costs were 2.3%.

Table 1 presents the physician and patient characteristics by prescriber group. The two groups did not differ significantly in physician age or number of years in practice or in the mean practice size. Patients' mean ages did not differ significantly between the two groups. De-

Table 1: Characteristics of general practitioners (GPs) who were high prescribers and low prescribers for elderly patients in New Brunswick from Apr. 1, 1990, to Mar. 31, 1991*

Characteristic	High prescribers	Low prescribers	χ^2 or t-test†		Pearson correlation	
			χ^2 or t	p	r	p
Age,‡ yr	43.4 (13.7)	43.1 (10.3)	0.23	0.82	0.08	0.13
Male: female ratio	8.0 (167/21)	3.4 (145/43)	9.11	< 0.01	0.19	< 0.001
Ratio of GPs qualified by CCFP to those not qualified by CCFP§	0.5 (58/127)	0.3 (39/140)	4.26	< 0.05	0.11	0.04
Ratio of GPs trained in Canada to those not trained in Canada	11.3 (170/15)	4.7 (147/31)	7.10	< 0.01	0.14	0.01
No. of practice days‡	224.2 (39.7)	185.7 (68.5)	6.64	< 0.001	0.41	< 0.001
No. of visits per day‡	27.4 (10.4)	21.9 (10.1)	5.18	< 0.001	0.30	< 0.001
No. of services per day‡	40.3 (22.7)	31.5 (19.5)	4.01	< 0.001	0.21	< 0.001
Amount billed per patient,‡ $	74.16 (17.91)	61.73 (29.22)	4.97	< 0.001	0.29	< 0.001
No. of patients seen per year‡	2 296 (1 029)	2 152 (1 229)	1.23	0.22	0.05	0.33
Amount billed per year,‡ $	164 728 (70 763)	126 366 (71 257)	5.24	< 0.001	0.28	< 0.001
Age of male patients,‡ yr	35.5 (6.1)	34.8 (8.8)	0.89	0.37	0.05	0.31
Age of female patients,‡ yr	37.9 (5.8)	37.2 (8.3)	0.98	0.33	0.06	0.27

*High prescribers were GPs who ordered more prescriptions than the mean and low prescribers were those who ordered fewer than the mean.
†χ^2 test was used for frequency data and the t-test for parametric data.
‡Mean (and standard deviation [SD]).
§CCFP = Canadian College of Family Physicians.

spite this similarity in practice size and patient characteristics the high prescribers billed significantly more overall than the low prescribers ($164 728 v. $126 366). Compared with the low prescribers the high prescribers had more practice days, saw significantly more patients each day, performed more services per patient and billed more for each patient. They were also more likely to be male, be qualified by the Canadian College of Family Physicians (CCFP) and have been trained in Canada. We could not distinguish between residency-trained and non-residency-trained GPs with CCFP qualifications.

We found a significant linear relation between the prescribing behaviour and physicians' sex, country where training was received, number of practice days, number of patients seen each day, number of services performed, average billing per patient and total billing. There was no significant linear relation between prescribing behaviour and physicians' age, time since qualification, CCFP qualification, practice size, mean patient age and prescribing characteristics.

The relation between prescribing behaviour and drug category is shown in Table 2. The prescribing ratio per physician was significantly greater in the high-prescriber group than in the low-prescriber group for all 11 categories. These differences were most marked for benzodiazepines, bronchodilators, gastrointestinal drugs and narcotics.

Discussion

These data clearly show that there is a relation between prescribing behaviour and GP characteristics. Although the two groups did not differ significantly in practice size or mean age, the high prescribers billed the NBMP 30% ($7.2 million) more than the low prescribers. One obvious conclusion is that the high prescribers generally saw their patients more often, a conclusion supported by their higher billings per patient.

Given the relation between the physicians' practice characteristics and their prescribing behaviour two explanations are possible: the high prescribers were either more efficient or more iatrogenic. First, it is possible that the high prescribers were better diagnosticians and had patients who were generally more ill and thus had to be seen more often. They may have had to diagnose more medical conditions that required more attention, more drugs and closer follow-up.

Second, since the high prescribers must have had to spend less time with each patient on average than the low prescribers and if both groups spent equal amounts of time in their offices per day, the high prescribers presumably took less time to listen to their patients' problems and may have performed a more cursory examination. Their patients may have been more ill because they received a lower quality of care and thus were prescribed more medications and likely suffered more adverse drug reactions. These patients consumed on average 45% more drugs than those of the low prescribers. This increase in medication use may have accounted for the increased frequency of visits to their GPs.

It is also possible that the high-prescriber group comprised both types of GPs.

With this data alone we cannot draw any definite conclusions regarding the most likely effects of these differences in prescribing behaviour. It will be necessary to gather information on patient morbidity and mortality to measure the differences in patient health between the two physician groups. We plan to link these data to the New Brunswick Hospital database and the New Brunswick Vital Statistics database. This will allow us to compare patient outcomes and assess their relation to practice characteristics and prescribing behaviour between the two physician groups.

Despite these limitations, this study describes a unique methodology for comparing physicians' practice characteristics and prescribing behaviour. This will al-

Table 2: Prescribing patterns of GPs by category of drug

| Category | Group; prescribing ratio per physician (and SD) | | Difference, % | p^* |
	High prescribers	Low prescribers		
Antibiotic	1.20 (0.40)	1.07 (0.28)	12	< 0.01
Antidepressant	1.31 (0.56)	0.94 (0.50)	39	< 0.001
Antihypertensive	1.39 (0.52)	0.96 (0.47)	45	< 0.001
Barbiturate	1.16 (0.69)	0.86 (0.52)	35	< 0.001
Benzodiazepine	1.63 (0.50)	1.07 (0.46)	52	< 0.001
Bronchodilator	1.92 (0.65)	1.24 (0.63)	55	< 0.001
Cholesterol-lowering drug	1.28 (0.64)	0.89 (0.54)	44	< 0.001
Gastrointestinal drug	1.61 (0.51)	1.03 (0.37)	56	< 0.001
Narcotic	1.29 (0.57)	0.78 (0.58)	65	< 0.001
Neuroleptic	1.19 (0.63)	0.82 (0.54)	45	< 0.001
Nonsteroidal anti-inflammatory drug	1.45 (0.50)	1.03 (0.36)	41	< 0.001

*Unpaired t-test.

low for more efficient evaluation of physicians' performance and will facilitate the development of practice guidelines. It will also guide more specific and appropriate continuing medical education programs for physicians found to be at risk.

On the basis of our data we recommend that other provinces link their databases to confirm or refute our findings. Since these databases are now widely available in Canada, our methodology can be readily used to assess the effect of physician characteristics and prescribing behaviour on patient outcomes. It could also be used to examine the effect of strategic interventions such as academic detailing and continuing medical education on physician characteristics and prescribing behaviours.

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