

Prescribing of potentially inappropriate medications to elderly people

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Objective. To estimate the prevalence and predictors of medications deemed potentially inappropriate for the elderly among family physicians' patients aged 65 and older (seniors) taking multiple prescribed medications.

Methods. Forty-eight randomly selected family practices in 16 towns and cities in Southern Ontario, Canada and 889 of their senior patients were recruited into a randomized trial. We conducted a cross-sectional analysis of prescription insurance data from the provincial universal prescription insurance database over 12 months, from the 777 seniors who completed the trial and agreed to have their data released. The prevalence and patient and physician predictors of use of a potentially inappropriate medication (PIM), as defined by published widely accepted criteria, were examined.

Results. The median number of prescriptions filled was 24. Nearly one-fifth (16.3%) of the seniors received at least one prescription for a PIM, with short-acting benzodiazepine prescriptions for longer than 30 days (6.4%) and oxybutynin (3.7%) being the types prescribed most frequently. In univariate and multiple variable analyses, women were found to be statistically significantly more likely to be prescribed a PIM (adjusted OR = 1.6; 95% confidence interval = 1.0–2.4). Age, education, self-rated health, number of health conditions, and number of prescriptions were not associated with PIM use. Physician gender, family medicine certification status, and time since graduation were not significantly associated with PIM prescribing.

Conclusions. Prescribing of PIMs, especially of short-acting benzodiazepines was common in seniors taking multiple medications. Interventions to reduce use of PIM, especially long-term benzodiazepines, are important in primary care.

Keywords. Appropriateness, elderly, medication, prescribing.

Introduction

Medication-related problems have been well documented, including the use of medications that are potentially inappropriate for the elderly.¹ Suboptimal or inappropriate prescribing has been linked to excess morbidity and hospitalization.² Criteria that were

initially developed for defining inappropriate prescribing in frail elderly nursing home residents³ have been adapted for use in community-dwelling elderly.⁴ This study assessed the patient and physician predictors of potentially inappropriate medication use among randomly selected community-dwelling elderly who participated in a randomized controlled trial in Ontario, Canada.

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Methods

A list of family physicians practising in Southern Ontario was generated, and random selection and recruitment took place until the target sample size for a randomized trial ($n = 48$) was obtained (69.6% acceptance rate).⁵ Physicians who participated were

similar in age and gender to those who refused,⁵ and more participating physicians (41.7%; 20/48) were certified with the Canadian College of Family Physicians than physicians who refused (33.3%; 7/21) ($P = 0.51$). Patients of the participating physicians were at least 65 years of age, taking five or more regular daily medications (prescription or non-prescription), and were randomly selected (20 per practice) and invited to participate in the trial (69.5% participation rate).

Medication information was obtained from the administrative database of the Ontario Drug Benefit Programme (ODB), which provides prescription medications to Ontario residents aged ≥ 65 years. Data were obtained for each consenting patient for a total of 29 months, including 12 months before the trial began. A self-administered questionnaire on socio-demographic characteristics and health-related quality of life [Medical Outcomes Study Short Form (SF)-36⁶] was completed by each senior at enrolment. Current

medical conditions were determined by chart audit. Information was obtained on the physicians' gender, years since graduation from medical school, and certification with the Canadian College of Family Physicians. The study was approved by the McMaster University Research Ethics Board.

The list of potentially inappropriate medications derived by Beers *et al.*^{3,4} was used (see Table 1, footnote). In addition, prescriptions of short-acting benzodiazepines with >30 days supply and the prescription of more than one benzodiazepine or non-steroidal anti-inflammatory drug (NSAID) simultaneously were included. Simultaneous prescribing of prophylactic (one tablet daily) acetylsalicylic acid (aspirin) with another NSAID was not included.

The outcome was the prescription of one or more potentially inappropriate medication, during the 12 months before the trial began. The predictors of receiving any one or more potentially inappropriate

TABLE 1 Factors associated with having a prescription for a medication considered to be potentially inappropriate for the elderly during the 12 months before enrolment

	Sample distribution (%) $n = 777$	Prescribed at least one potentially inappropriate medication ^a	Unadjusted OR (95% CI)	P -value	Adjusted OR ^b (95% CI)	P -value
Total population	100					
Age, years						
65–69	16.5	15.9	–	–	–	–
70–74	28.1	15.7	1.0 (0.5–1.6)	0.94	0.9 (0.6–1.6)	0.85
75–79	29.6	17.9	1.2 (0.7–1.9)	0.59	1.0 (0.6–1.8)	0.89
80+	25.9	19.5	1.3 (0.8–2.3)	0.40	1.1 (0.6–2.1)	0.64
Gender						
Male	37.5	12.7	–	–	–	–
Female	62.5	19.5	1.7 (1.1–2.5)	0.02	1.6 (1.0–2.4)	0.03
Education						
Graduate/professional	4.0	1.5	–	–	–	–
Elementary	22.8	25.0	3.3 (0.8–14.6)	0.11	2.6 (0.6–11.7)	0.21
Secondary	53.5	58.3	3.3 (0.8–14.1)	0.11	2.8 (0.6–12.1)	0.17
College/University	19.7	15.2	2.2 (0.5–9.8)	0.31	1.8 (0.4–8.4)	0.43
Self-reported health						
Excellent–good	75.8	30.3	–	–	–	–
Fair–poor	24.2	69.7	1.5 (1.0–2.2)	0.08	1.3 (0.8–2.1)	0.22
No. of prescriptions						
Median of 24	50.0	42.4	–	–	–	–
>median	50.0	57.6	1.4 (0.9–2.0)	0.10	1.2 (0.8–1.9)	0.29
No. of conditions (mean, SD)	5.4, 2.3	5.5, 2.3	1.0 (0.9–1.1)	0.56	1.0 (0.9–1.1)	0.86

^a Any potentially inappropriate medication (including short-acting benzodiazepines >30 days supply) = 16.3%, any potentially inappropriate medication (excluding short-acting benzodiazepines >30 days supply) = 11.1%: (i) short-acting benzodiazepine (lorazepam, oxazepam, alprazolam or triazolam) >30 days = 6.4%; (ii) oxybutynin = 3.7%; (iii) indomethacin = 1.2%; (iv) amitriptyline or perphenazine-amitriptyline = 3.3%; (v) chlorthalidone = 0.1%; (vi) diazepam = 0.5%; (vii) flurazepam = 0.4%; (viii) doxepin = 0.3%; (ix) meprobamate = 0.1%; (x) disopyramide = 0.1%; (xi) methyl dopa or methyl dopa hydrochlorothiazide = 0.1%; (xii) chlorpropamide = 0.1%; (xiii) barbiturates = 0.1%; (xiv) ticlopidine = 0.1%; (xv) methocarbamol, cariprodol, chlorzoxazone, metaxalone, cyclobenzaprine, phenylbutazone, trimethobenzamide, reserpine, dicyclomine, hyoscyamine, propantheline, belladonna alkaloids, clidinium chlorthalidone, chlorpheniramine, cyproheptadine, hydroxyzine, promethazine, meperidine, antihistamines, dipyrindamole, pentazocine or propoxyphene = 0%; (xvi) double NSAID (excluding low-dose aspirin for prophylaxis = 0.6%; (xvii) double benzodiazepine = 0.4%; digoxin 0.125 mg not included because the indication for a higher dose could not be ascertained.

^b Adjusted for all other factors in the table.

medication were determined by univariate analyses that estimated odds ratios (ORs) and 95% confidence intervals (CIs) for the following potential correlates: age, gender, education, self-reported health (SF-36), number of chronic health conditions and higher number of prescriptions (more than the median number for the sample). All predictor variables used in univariate analyses were included in a multiple variable logistic regression model. A separate univariate analysis of physician predictors of mean number of potentially inappropriate medications prescribed per patient in their practice using Student's *t*-test or Pearson's correlation was done, controlling for patient characteristics. A two-sided alpha of <0.05 was considered statistically significant in all analyses.

Results

Of the 889 initial trial participants, 777 patients who were alive and gave consent were included in the analyses. The mean age was 74.1 years (SD = 6.0), 62.5% (486/777) were female, and the median number of prescriptions during the 12 months was 24 (mean, 30.0; SD, 22.6; range, 2–258). Approximately one-quarter (24.2%; 188/776) of participants reported fair or poor health. The five most common health conditions were hypertension (54.2%; 421/777), osteoarthritis (46.8%; 364/777) ischaemic heart disease (36.6%; 284/777), hyperlipidaemia (32.1%; 249/777) and angina [23.2%; 180/777, 155 (54.6%) of whom had ischaemic heart disease].

The overall prevalence of use of any one or more potentially inappropriate medication was 16.3% (127/777). Prescriptions for a short-acting benzodiazepine with a supply of >30 days (6.4%; 50/777) were the most common category of potentially inappropriate medications. The next most common category was oxybutynin (3.7%; 29/777) (Table 1). Among the 50 patients with any prescription of short-acting benzodiazepine, the mean number of benzodiazepine prescriptions was 3.4 (SD = 2.3), and 42.0% (21/50) of them had four or more prescriptions for varying lengths of supply >30 days, during the 12 months. In univariate analysis, being prescribed at least one potentially inappropriate medication was significantly associated with being female (OR = 1.7, 95% CI = 1.1–2.5, $P = 0.02$). Self-reported fair or poor health nearly reached significance (OR = 1.5, 95% CI = 1.0–2.2, $P = 0.08$). In multiple logistic regression analysis, only females remained at significantly higher risk of being prescribed potentially inappropriate medications (OR = 1.6, 95% CI = 1.0–2.4, $P = 0.03$).

Male physicians tended to prescribe more potentially inappropriate medications than female physicians (mean per patient 0.19, versus 0.13, $P = 0.09$), and physicians not certified with the Canadian College of Family Physicians tended to prescribe more than physicians who were certified (mean per patient 0.18,

versus 0.15, $P = 0.26$); however, differences were not statistically significant. The number of years since graduation from medical school had a weak correlation ($r = 0.09$, $P = 0.54$) with the mean number of potentially inappropriate medications per patient. Controlling for patients' age, gender, self-reported health, number of prescriptions and number of health conditions did not alter the results.

Discussion

Prescribing of potentially inappropriate medications for elderly people living in the community was not uncommon, with nearly one in five seniors in this study receiving at least one potentially inappropriate medication during a year. However, most potentially inappropriate medication use was accounted for by short-acting benzodiazepines and amitriptyline. Administrative data do not provide information on the circumstances of prescribing and the rationale for physician and patient decisions, and physicians may feel justified in prescribing a high-risk medication if they are able to monitor the patient's dose and tolerance for adverse effects closely. In contrast to previous reports that physician characteristics such as age, specialization and university affiliation are associated with appropriateness of prescribing,^{7,8} we did not find that gender, certification with the Canadian College of Family Physicians or year of graduation from medical school were associated with potentially inappropriate medication prescribing.

One of the strengths of this study was that family physicians and patients were selected randomly from both urban and rural settings, with a high participation rate, increasing the generalizability of our findings to primary care prescribing in this area of Canada. In contrast to most studies using government prescription claims information, we had more detailed linked information on patient socio-demographic characteristics and medical conditions directly from patients and their physicians, allowing a more extensive analysis of predictors of potentially inappropriate medication use.

Interventions such as education, feedback and pharmacist medication assessment can alert physicians to potentially problematic prescribing⁹ and perhaps help overcome some of the challenges of managing older patients taking multiple medications for various conditions.

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