What drugs are our frail elderly patients taking?

Do drugs they take or fail to take put them at increased risk of interactions and inappropriate medication use?

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abstract

OBJECTIVE To determine whether there were discrepancies between what medications frail elderly outpatients took and what physicians thought they took and whether discrepancies put patients at risk of taking inappropriate drugs and of increasing the potential for drug interactions.

DESIGN Case series.

SETTING Day Hospital Program at St Mary's of the Lake Hospital in Kingston, Ont.

PARTICIPANTS One hundred twenty community-living elderly patients attending the Day Hospital Program in 1998. Three patients and two family physicians declined to participate.

MAIN OUTCOME MEASURES Lists of medications being taken by patients compared with lists of medications in physicians' charts. Category according to explicit criteria that each drug fell into and risk of drug interactions as determined by the Clinidata Drug Interaction Program.

RESULTS Of the 120 patients, 115 had at least one discrepancy between their lists of medications and their physicians' lists. Of the 1390 medications on the lists, 521 (37%) were being taken by patients without their doctors' knowledge, 82 (6%) were not being taken by patients when doctors thought they were, and 133 (10%) were on both patients' and their doctors' lists but with dosages or frequency of administration that were different. More potential drug interactions were identified on patients' lists than on physicians' lists. No increase in risk of inappropriate drug use was identified.

CONCLUSION Family physicians are often unaware of all the medications their patients are actually taking. Medications used by patients without physicians' knowledge increase the likelihood of drug interactions. Family physicians should look at and inquire about all medications, including over-the-counter drugs, their patients are actually taking.

résumé

OBJECTIF Déterminer l'existence de divergences entre les médicaments pris par des patients externes âgés et frêles et ceux que leurs médecins pensaient qu'ils prenaient, ainsi qu'établir si les divergences présentaient un risque pour ces patients de prendre des médicaments non indiqués ou d'augmenter la possibilité d'interaction médicamenteuse.

CONCEPTION Une série de cas.

CONTEXTE Un programme de clinique externe au St Mary's of the Lake Hospital, à Kingston, en Ontario.

PARTICIPANTS Un total de 120 patients âgés vivant dans la communauté, qui fréquentaient le programme de clinique de jour en 1998. Trois patients et deux médecins ont refusé de participer.

PRINCIPALES MESURES DES RÉSULTATS Les listes de médicaments pris par les patients en comparaison de celles dans les dossiers du médecin. La catégorie, selon des critères explicites, dans laquelle se classait chaque médicament et le risque d'interactions médicamenteuses en fonction du programme sur l'interaction médicamenteuse Clinidata.

RÉSULTATS Chez l'ensemble des 120 patients, il y avait au moins une divergence dans 115 cas entre les listes de médicaments des patients et celles de leurs médecins. Des 1390 médicaments qui figuraient sur les listes, 521 (37%) étaient pris par les patients à l'insu de leur médecin, 82 (6%) n'étaient pas pris par les patients alors que le médecin croyait que c'était le cas et 133 (10%) figuraient à la fois sur la liste du patient et du médecin, mais les doses et la fréquence d'administration différaient. On retrouvait plus fréquemment dans les listes des patients que dans celles des médecins des possibilités d'interaction médicamenteuse. On n'a observé aucune augmentation du risque d'un usage non approprié des médicaments.

CONCLUSION Il est fréquent que les médecins ne soient pas au fait de tous les médicaments que prennent en réalité leurs patients. Le recours à des médicaments à l'insu du médecin augmente la probabilité que survienne une interaction médicamenteuse. Les médecins de famille devraient s'enquérir de tous les médicaments, y compris les médicaments en vente libre, que prennent en réalité leurs patients et examiner cette liste.

This article has been peer reviewed.

Cet article a fait l'objet d'une évaluation externe.

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Elderly people comprise only 11% of the population but consume approximately 25% of prescription drugs.[1] Risk of an adverse drug reaction, defined as "a noxious, unintended drug reaction that occurs at doses normally used for prophylaxis, diagnosis, or therapy,"[2] is estimated to be two to three times higher among patients older than 65 than among younger patients.[3]

Factors that could contribute to this higher rate include polypharmacy,[2] inadequate clinical assessment, inadequate supervision of medication regimens, altered pharmacokinetics due to age, and poor patient compliance.[4] In addition, patients could be getting prescriptions from many different physicians, which could lead to poor communication about patients' medications and result in inappropriate or unsafe prescriptions.[5,6]

Physicians do not always have accurate records or complete knowledge of the medications their elderly patients are taking. Lists of medications provided by family physicians when patients are admitted to hospital or attend outpatient clinics often do not reflect what patients say they are taking.[7-9] Although a relationship between inaccurate drug records and problems such as polypharmacy, underprescription and overprescription, noncompliance, and adverse drug reactions can be assumed, it has not been delineated in studies. One study found that up to 70% of adverse drug reactions noted at time of hospital admission were related to drug interactions, "inappropriate prescribing," and unnecessary medications.[10]

Problems can be accentuated by family physicians' not knowing what medications their patients are actually taking. A MEDLINE search from 1985 to 2000 with the MeSH headings Drug Utilization, Drug Therapy/adverse effects, Medical History Taking, and Medication Errors, found no studies that looked at the association between medication discrepancies and consequences for patients.

This study, which looked at a group of frail seniors living in the community, aimed to determine how much family physicians' records of their patients' medication regimens differed from lists of medications patients were actually taking. Another objective was to determine the nature of the discrepancies and assess potential consequences (inappropriate drug use, drug interactions). Previous studies have focused on the prevalence of the problem, not the potential consequences for patients. Ethics review was conducted by Queen's University's Research Ethics Board.

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METHODS

Setting and subjects

The study was undertaken at the Geriatric Day Hospital at St Mary's of the Lake Hospital in Kingston, Ont. Our sample consisted of 120 men and women older than 65 living in the community. They had been referred to the southeastern Regional Geriatric Program by various people including family physicians, home care personnel, and family members. All patients had to have a family physician to be admitted to the program. Patients attended the day hospital from home 2 days each week for 4 to 5 hours a day.

Selection of participants

Consecutive patients admitted to the day hospital between January 1 and December 17, 1998, were considered for inclusion. Patients were excluded if they did not give consent, if they were not taking any medications, and if they lived in nursing homes or retirement homes. The latter were excluded because of the likelihood that staff supervised medication regimens. Cognitively impaired patients (ie, those with a Mini-Mental State Examination score $<24/30$) were not excluded because they are at high risk of making errors with medication. Patients attending the day hospital generally have enough cognition to have potential for rehabilitation.

Intervention

At time of admission to the day hospital, the pharmacist obtained consent from each patient (or his or her legal guardian) who met the inclusion criteria. How many medications patients had actually taken during the previous 4 weeks was determined by the pharmacist as part of standard admission procedures; the list included over-the-counter (OTC) medications, "take as necessary" medications, vitamin and mineral supplements, and animal and herbal products. Medication lists were obtained by interviewing patients and primary caregivers when necessary and by visual review of prescribed and OTC medications. When information about medications remained

unclear, the community pharmacist was contacted for clarification.

Family physicians were informed of patients' inclusion in the study by letter and were asked to provide lists of medications prescribed for patients as documented in their clinic charts. They were also asked to sign a consent for use of medical record information in the study. If a family physician did not respond to the letter, the pharmacist telephoned the physician's office to discuss the request and, if possible, obtain consent and medication information.

Physicians' and patients' medication lists were compiled, and the rate of discrepancies determined. Discrepancies were termed "deletions" if patients were not taking medications on physicians' lists and "additions" if patients were taking medications not listed in their charts. Discrepancies in drug dosages and dosing schedules were also recorded. Drugs were identified as being prescription or OTC and were divided into six categories: central nervous system, cardiovascular, pulmonary, gastrointestinal, musculoskeletal, and other.

Medications were also categorized using explicit criteria developed by Beers et al to identify potentially inappropriate drug use among elderly people.[11,12] Their classification has three categories: drugs that should be avoided, drugs that have dose limitations for elderly people, and drugs that elderly people can take only for a limited time. These criteria were developed using Delphi consensus methodology and were updated in 1997 in an attempt to generalize them to the general population older than 65 rather than to only the frail elderly.[12]

Drug interaction potential was estimated by comparing the number of mild, moderate, and severe interactions on patients' lists with those identified on physicians' lists. The Clinidata Drug Interactions computer program was used to assess potential drug interactions.[13]

Outcome measurement validity and reliability

Criteria for inappropriate drug use in this study were chosen for their ease of applicability and because organization into three categories of inappropriate use was thought likely to be informative. Also, a variety of studies had been done using these criteria.[14-16] A Canadian consensus list had been published in 1997[17] after funding had been granted for using the criteria of Beers et al, and this list had not been used for research purposes at the time of this study. The criteria of Beers et al,[11] validated using Delphi consensus methodology, lacked quantitative measures of validity and reliability. The Canadian consensus list also did not provide quantitative data.[17]

Statistical testing and sample size calculation

Data were managed using Microsoft Access; statistical analysis was done using SPSS for Windows. Prevalence figures cited in the literature[5,7-9] indicated that a sample size from 77 to 96 subjects would provide a 95% probability that estimates obtained would be within 10% accuracy. Sample size was also calculated based on the need to detect a difference of two drug interactions between a patient's list and his or her physician's list. Since the measured difference was 5 with a standard deviation (SD) of approximately 1, the study's power approached 100%.

RESULTS

Of the 120 patients, 86 (71.7%) were women and 34 (28.3%) men. Difference in mean age of men (77.3 years; SD 6, range 65 to 89) and women (78.3 years; SD 6.5, range 65 to 92) was not statistically significant (Student's *t* test, *P* .446) Three patients and two family physicians declined to participate in the study. Patient data were not analyzed when the family physician did not consent to participate.

The difference between mean number of medications on patients' lists (10.5; SD 3.18) and mean number on physicians' lists (7.2; SD 4.18) was statistically significant (paired samples *t* test, *t* 13.3, *P* .001). Mean number of discrepancies per patient was 5.85 (range 0 to 15); 115 of the 120 patients (95.8%) had at least one discrepancy between lists. More than six discrepancies were found on 45 (37.5%) patients' lists.

Of the 1390 medications on the lists, 654 (47%) were on both patients' and physicians' lists, and dosages and frequency of administration were the same. In 521 cases (37%), a drug was on a patient's list but not on his or her doctor's list (additions). In 82 cases (6%), a drug was on a doctor's list but not on his or her patient's list (deletions). In 133 cases (10%), a drug was on both doctor's and patient's lists, but dosage or frequency of administration was different.

Table 1 shows type of discrepancy by sex of patient. Men were more likely than women to have additions (RR 1.28, 95% CI 1.12 to 1.48), but less likely to have deletions (RR.36, 95% CI.19 to.70). In other words, men took what their physicians thought they were taking and more besides.

Many of the medications being taken without physicians' knowledge were OTC drugs; of the 1390 medications, 783 were prescription drugs and 607

Table 1. Nature of discrepancies on medication lists of men and women patients compared with their physicians' lists: *Most patients had more than one prescription.*

DISCREPANCIES	ALL PATIENTS NO. (%)	MEN NO. (%)	WOMEN NO. (%)	*P* VALUE
No discrepancies	654 (47)	171 (44)	483 (48)	.247
Additions*	521(37)	172 (45)	349 (35)	.001
Deletions†	82 (6)	10 (3)	72 (7)	.001
Dosage discrepancies‡	133 (10)	32 (8)	101 (10)	.377
TOTAL	1390 (100)	385 (100)	1005 (100)	

**Patient was taking a medication not on his or her physician's list.*
†Patient was not taking a medication on his or her physician's list.
‡Discrepancies in drug dose or dosing schedule.

were OTC drugs. When only prescription drugs were included in assessment of discrepancies, there were 152 additions, 59 deletions, and 93 dosage discrepancies. This means that, for nearly 40% of prescribed medications, there were discrepancies between what physicians thought patients were taking and what they were actually taking.

Each medication was also categorized according to Beers' Classification of Inappropriate Drug Use (**Table 2**). More than 90% of the medications did not fall into a category that would classify them as potentially inappropriate drugs for elderly people. There was no difference in the proportion of discrepancies when "inappropriate" drugs were compared with "appropriate" drugs. Of the 103 drugs deemed inappropriate, 95 were prescribed medications and only eight were OTC drugs.

Table 2. Number of medications in various categories of Beers' Classification of Inappropriate Drug Use in the elderly: *Total number of medications listed was 1390.*

MEDICATIONS	CLASS 0 APPROPRIATE TO USE IN THE ELDERLY	CLASS 1 SHOULD BE AVOIDED IN THE ELDERLY	CLASS 2 DOSAGE LIMITS IN THE ELDERLY	CLASS 3 DURATION LIMITS IN THE ELDERLY
Number	1287	43	7	53
Percentage	92.6	3.1	0.5	3.8

Figure 1 shows the number of medications in each category for which there were discrepancies between physicians' lists and patients' lists. Most notable is the small proportion of cardiovascular drugs that had discrepancies compared with other types of drugs.

The final question we sought to answer was whether the potential for interactions was significantly higher on patients' lists than on physicians' lists. We have already shown that, on average, patients were taking three more medications than physicians thought they were. **Table 3** shows mean number of potential interactions on patients' lists compared with mean number on physicians' lists. Significantly more potential mild, moderate, and severe interactions were found on patients' lists.

DISCUSSION

This study demonstrates that physicians often do not know what medications their elderly patients are taking. Nearly 96% of patients were not taking exactly what their physicians thought they were. These discrepancies could put patients at risk of drug interactions, which is important, especially given the high proportion of discrepancies that involved OTC medications.

Most of the discrepancies were due to patients' taking drugs that physicians did not know about. Often it was differences in the understanding of what dosage or administration frequency should be; less frequently, it involved drugs prescribed by physicians that patients were no longer taking. While 60% of the discrepancies involved OTC drugs, 40% (304 instances) involved prescribed medications.

Over-the-counter drugs

Physicians' concerns about OTC medications have been heightened by an increase in use of alternative medications and by studies showing common OTC drugs involved in severe interactions.[18-20] Aside from the potential for direct adverse reactions from unsupervised consumption of OTC medications, such consumption could increase drug interactions. In our assessment of risk of interactions, patients' lists contained significantly more potential interactions than physicians' lists did. Most commonly, increased risk was related to additions, most of which were OTC medications.

Inappropriate drugs

Fortunately, discrepancies did not appear to put patients at higher risk of taking inappropriate medications, as defined by the classification of Beers et al. Only 4.2% of all medications on all lists fell into one of their "inappropriate" categories. While this figure increases to 12% if only the 783 prescribed medications are considered, it is still much lower than the

Figure 1. Number of medications with and without discrepancies on lists by drug group

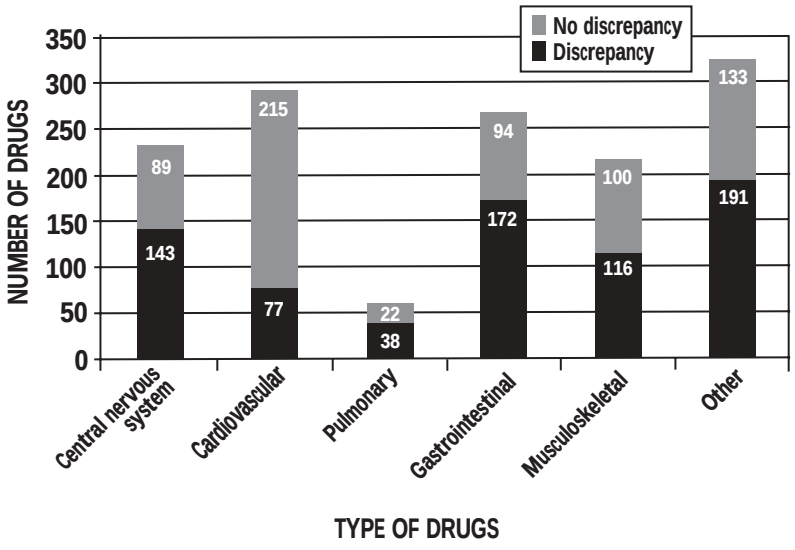

Table 3. Mean number of potential drug interactions on physicians' and patients' lists

INTERACTIONS	PATIENTS' LISTS N (95% CI)	PHYSICIANS' LISTS N (95% CI)	*P* VALUE*
Mild	4.7 (3.8-5.6)	2.4 (1.9-2.9)	< .001
Moderate	7.7 (6.5-8.9)	4.7 (3.9-5.4)	< .001
Severe	0.25 (0.15-0.35)	0.16 (0.02-0.24)	< .016
TOTAL	12.7 (10.7-14.6)	7.3 (6.1-8.5)	< .001

**Paired samples t test.*

52% quoted in a previous Canadian study.[21] That study, however, used a wider variety of criteria to define inappropriate prescriptions.

Types of discrepancies

Assessment of discrepancies by drug group was also of interest. Rate of discrepancies by drug group ranged from 53% to 63% except for cardiovascular drugs where the rate was only 26%. This suggests that physicians or patients or both are more vigilant about medications for cardiac care.

Although there was no difference in risk of drug discrepancies by sex, there were differences between men and women in the nature of discrepancies. Differences in prescribing for elderly men and elderly women have been reported, with a higher incidence of questionable prescribing found for women.[21] In this study, appropriateness of prescribing was not analyzed by sex, but men were more likely to take additional medications than women were. Women were more likely not to be taking all the medications their physicians thought they were. These differences could be considered when reviewing patients' medications in the office.

Assessment of risk

Our overall finding that discrepancies did not increase risk of inappropriate drug use does not mean risk was not increased for individual patients. One patient, for example, was taking two benzodiazepines (lorazepam, clonazepam), an antipsychotic (perphenazine), and an antidepressant (fluvoxamine) that were not included on the physician's list of medications. Another patient was taking ipratropium bromide, salbutamol, clonazepam, hydrochlorothiazide-triamterene, diltiazem, acetaminophen with codeine, omeprazole, and colchicine without a doctor's knowledge. Another patient with Parkinson disease was taking tolcapone without it being noted on the chart. This is of concern given the well-publicized risk of hepatic damage. Deletions also caused some potentially worrying discrepancies (eg, one patient was not taking metoprolol, nifedipine, or amitriptyline as listed on the physician's chart).

Awareness of problems with older patients' medication lists is the first step in management. Although few studies have looked at its effectiveness in reducing discrepancies, all current prescription medications and

OTC and herbal preparations being taken by patients should be reviewed periodically. The "brown bag" approach has been advocated for this review[22,23]; patients should also be asked whether they have discontinued medications at home.[5] Encouraging patients to use a single pharmacy and computerizing drug records might help identify medication errors.[24]

Limitations

Although we tried to ensure in many ways that we had accurate lists of what medications patients were actually taking, there was no way of being absolutely certain. Patients' recall of OTC medication use in the preceding 4 weeks might have been faulty, probably leading to underreporting. Some medications, especially OTC drugs, might have been used by patients without family members or the community pharmacist knowing.

Physicians aware of the nature of the study might have reviewed patients' charts more carefully than they normally would. The opposite might also have been true. They might have taken less care because they were reviewing the chart for research purposes, which they might see as less important than direct patient care.

Patients were not asked when they had last seen their family physicians, a potentially important factor because patients who see their family physicians infrequently could be at higher risk of discrepancies. Given that subjects took an average of seven medications, however, it is likely that most had seen their physicians for prescription renewal within 3 to 6 months of the day hospital visit.

We made no attempt to determine how patients got prescription medications not listed on their charts. Previous investigators have found that prescriptions not known to patients' doctors were written by previous doctors or by specialists.[5] Although family physicians cannot usually control who prescribes for their patients, it would help if consulting physicians would recommend medications to family physicians (as is done at St Mary's of the Lake Day Hospital) rather than provide patients with prescriptions. This practice might decrease drug errors.[6]

We did not determine whether potential drug interactions had ever, in fact, occurred. This would have involved detailed assessment of each patient's chart (to which we did not have easy access) and an expectation that patients could recall symptoms of interactions. Previous studies have cited similar concerns about this limitation.[25,26]

As with many geriatric medicine studies, generalizability is in question. Day hospital patients generally fulfil criteria for "frail elderly," defined as people older than 65 years who depend on others for activities of daily living.[27] The frail elderly are estimated to account for between 14% and 27% of people older than 65.[28] Patients in this study frequently relied on others for at least one activity of daily living and were taking on average seven or more medications, which is more than most elderly people take.[29] Subjects, however, were all living in the community without need for institutionalization and make up a substantial portion of family physicians' older patients. Frail elderly patients are likely at highest risk of adverse drug events and for drug errors because they take many medications.[25,30,31] Consequently, they are more likely to benefit from close attention to medication prescribing and drug discrepancies.

Editor's key points

- Most frail elderly people attending a day program at a hospital in Kingston, Ont, had at least one discrepancy between their own lists of medications and their physicians' lists.
- In 37% of cases, patients were taking medications without their doctors' knowledge, and in 6%, patients were not taking medications on their doctors' lists.
- About 60% of discrepancies involved over-the-counter drugs; 40% involved prescription medications.
- More potential drug interactions were identified on patients' lists than on doctors' lists, but overall, there was no increased potential for inappropriate drug use.

Points de repère du rédacteur

- Il existait chez la majorité des patients âgés et frêles qui fréquentaient une clinique de jour à un hôpital de Kingston, en Ontario, au moins une divergence entre leur propre liste de médicaments et celle de leur médecin.
- Dans 37% des cas, les patients prenaient des médicaments à l'insu de leur médecin et dans 6% des cas, les patients ne prenaient pas les médicaments qui se trouvaient sur la liste de leur médecin.
- Les divergences portaient dans 60% des cas sur des médicaments en vente libre; dans 40% des cas, il s'agissait de médicaments sur ordonnance.
- On retrouvait plus fréquemment dans les listes des patients que dans celles des médecins des possibilités d'interaction médicamenteuse, mais dans l'ensemble, il n'y avait pas d'augmentation du risque éventuel d'un usage non approprié des médicaments.

CONCLUSION

Family physicians are often unaware of what medications their frail elderly patients are actually taking. Using prescription and OTC medications without physicians' knowledge increases the potential for severe drug interactions.

Further research into the effectiveness of physicians' intervention to reduce drug discrepancies could provide family physicians with level 1 evidence of the benefit of reviewing elderly patients' medications annually as part of a preventive health strategy.

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Contributors

Drs Frank, Godwin, Verma, *and* **Anderson** *and* **Ms Kelly** *all contributed to study design. The study was carried out by all the authors except* **Dr Godwin. Dr Godwin, Ms Birenbaum,** *and* **Ms Seguin** *analyzed the data. All the authors contributed to interpreting the data and writing the article.*

Competing interests

None declared

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