Medication Use in the Seniors Population: Optimization of Physician Prescribing as a Means of Preventing Drug-related Illness*

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RÉSUMÉ

Les maladies reliées aux médicaments (MRM) sont fréquentes chez les aînés. La mauvaise utilisation des médicaments et la prescription d'ordonnances potentiellement non appriopriées (OPNA) sont responsables de plus de la moitié des admissions hospitalières reliées aux MRM. Ceci pourrait être évité. Les médecins contrôlent l'accès aux médicaments d'ordonnance. Ils peuvent donc prévenir l'exposition des patients âgés aux médicaments inutiles et aux OPNA, et influer sur l'utilisation des médicaments par leurs patients. On a identifié certaines interventions efficaces pour améliorer les habitudes de prescription chez les médecins. Mais leur implantation est coûteuse. Elles doivent être maintenues de façon continue pour conserver leur efficacité. Elles sont inopérantes sur les OPNA générés par des prescripteurs multiples. Elles ne permettent pas au médecin de rester à jour sur le nombre croissant de médicaments qui font leur entrée sur le marché chaque année. On propose ici d'utiliser les technologies informatiques de réseautage et d'aide à la décision pour offrir aux médecins prescripteurs (1) des informations précises et actualisées sur les médicaments dispensés à leurs patients âgés, (2) une revue des problèmes médicamenteux existants et de ceux créés par de nouvelles ordonnances et (3) des conseils d'experts sur le choix d'un traitement médicamenteux. Le Canada est dans une position idéale pour devenir un pionnier dans le développement de tels systèmes. Mais il faudrait d'abord mettre en place certaines politiques pour régler trois problèmes. Premièrement, l'information disponible sur les risques et les bénéfices des médicaments chez les aînés est inadéquate car les personnes âgées «les plus malades» sont souvent exclues des essais cliniques. Les prérequis à l'approbation des médicaments doivent être amendés afin de permettre une évaluation satisfaisante des risques et des bénéfices des nouveaux médicaments chez les aînés. Deuxièmement, l'informatisation du système de santé est primordiale dans le développement d'outils informatiques

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d'aide à la décision pour la dispensation des soins. Les politiques futures devraient favoriser le développement d'une infrastructure efficace si l'on veut faciliter la transition vers un système de santé informatisé et intégré. Troisièmement, les questions de nature éthiques et légales reliées à l'accès des données de consommation des médicaments via les réseaux informatiques doivent être identifiées. Des règles de conduite claires sur l'utilisation des nouvelles technologies doivent être développées.

ABSTRACT

Drug-related illness (DRI) is a common problem in the elderly. Misuse of medications and inappropriate prescribing account for over half of all hospital admissions for DRI and both are potentially preventable. Physicians are the gatekeepers to prescription medication access and, in this role, they have the opportunity to prevent exposure to unnecessary and inappropriate medication and influence the use of medications by their elderly patients. Effective interventions to improve physician prescribing have been identified but they are costly to introduce, they require ongoing maintenance to maintain their effectiveness, they do not address the problems created by multiple prescribers or the challenges of keeping up-to-date on the growing number of new drugs that enter the market each year. Computer-based drug information networks and expert decision-making support systems are proposed as one means of providing (1) an accurate record for the prescribing physicians of drugs currently dispensed to their elderly patients, (2) a review of problems in existing and new prescriptions, and (3) an expert resource to select drug treatment. Canada is in an ideal situation to pioneer the development of these systems, but to do so, policies need to be put in place to address three problems. First, there is inadequate information available about the risks and benefits of drugs in the elderly because older sicker adults are often excluded in clinical trials of drug-effectiveness. Requirements for drug approval need to be amended so that sufficient evaluation of the risks and benefits of new drugs are carried out in the elderly. Second, computerization in the health care sector is central to the development of electronic decision-support systems in health care delivery. Future policy needs to be directed to the development of an effective infrastructure to facilitate the transition to an integrated computerized health sector. Third, the ethical and legal issues related to the access of prescription data through electronic networks need to be identified and clear guidelines for use of this new technology need to be developed.

This paper will review the problem of drug-related illness in the elderly, its consequences in terms of avoidable morbidity, and the contribution of physician prescribing to its occurrence. This will be followed by a review of interventions that have proven to be effective in improving physician prescribing as well as the barriers to adopting research into practice. Solutions to overcome these problems will then be outlined and the changes in policy needed to facilitate change will be identified.

The Problem

Drug-related illness is a significant health problem, and in many instances it is preventable. Between 3 and 23 per cent of all hospital admissions[1] and 1 in 1,000 deaths[2] are attributable to drug-related illness. Elderly patients

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Table 1
The prevalence of potentially inappropriate prescribing in the study sample (n = 65,349) and estimates of prevalence in the Quebec population[1]

Potentially Inappropriate Prescribing Category	*Prevalence in the Study Sample*	*Estimated Prevalence in the Population*	
	% of Sample	*Number of Individuals*	*% of Population*
Drug combinations			
Cardiovascular drugs	11.6	72,052	10.0
Psychotropic drugs	15.6	93,343	13.0
NSAIDs & analgesics	7.9	49,089	6.8

are particularly vulnerable,[1] because 40 per cent of all prescriptions are dispensed to people in this age group.[3] Misuse of medications is common in the elderly and accounts for 22–66 per cent of hospitalizations for drug-related illness.[4-7] Potentially inappropriate prescribing is an additional risk factor for drug-related illness as it accounts for 19–36 per cent of hospitalizations due to drug-related events.[4-7] A prescription is considered to be potentially inappropriate when the risk of an adverse event for a patient who is prescribed the drug is judged to far outweigh the expected benefit in all but the rarest of circumstances. Recent evidence suggests that the elderly are more likely to receive unnecessary, and in some instances potentially inappropriate medication. It has been estimated that 3–36 per cent of the elderly receive at least one potentially inappropriate prescription in a year,[8,9] and 50 per cent receive a prescription for an unnecessary drug.[10]

Potentially inappropriate prescribing represents an unwarranted cost to the health care system and a possible preventable cause of morbidity in the elderly. In drug groups commonly implicated in drug-related illness (NSAIDs[5,12,13] cardiovascular drugs,[12,13] psychotropic drugs[14-16]), one Quebec study[11] found that 45.6 per cent of seniors received at least one potentially inappropriate prescription annually. Potentially inappropriate combinations for cardiovascular and psychotropic drugs were the most frequent, and therapeutic duplications (prescription of two drugs from the same category that may increase the risk of overdose toxicity) was the most common form of potentially inappropriate combination (Table 1).

From a public policy perspective, the key question is whether the prevalence of potentially inappropriate prescribing in the elderly has a substantial impact on morbidity and mortality. While the answer to this question is unknown, existing clinical evidence[17-19] can be used to estimate the magnitude of the potential impact for specific drug and disease combinations. Using Quebec data, we examined four potentially inappropriate forms of cardiovascular drug therapy that were sufficiently prevalent to have an impact on avoidable morbidity (Table 2). From available clinical evidence, we estimate that exposure to asthma medication with a betablocker, K+ sparing diuretic with a potassium supplement, or Warfarin with an NSAID or Sulfonamide may result in a five fold increase in the risk of admission for acute respiratory,[20-23] cardiac[17-19] or bleeding problems[24-34] respec-

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Table 2
The prevalence of four potentially inappropriate drug combinations and estimated number of hospitalizations/year due to exposure (assuming RR = 5.0)

High Risk Drug Combination	*Prevalence of Exposure: in Quebec Elderly*[1]		*Excess Cases per Year Attributable to Exposure*	
	Number of Individuals	*%*	*Likely Outcome of Exposure2*	*Number of Cases per Year due to Exposure*
Asthma medication + beta-blocker	11,050	1.54	Respiratory admissions/death	608
K^+ sparing diuretic + K^+ supplement	8,087	1.12	Cardiac admissions/death	1260
Warfarin + NSAID	2,578	0.36	Bleeds – admissions/death	42
Warfarin + Sulfonamides	1,987	0.28	Bleeds – admissions/death	32

tively. Using provincial hospitalization data from 1991 to estimate the yearly incidence of hospitalizations for these conditions, we estimated that exposure to these potentially inappropriate combinations may be responsible for 1,942 admissions and deaths each year among Quebec elderly. Many of these admissions may be preventable.

Potentially inappropriate prescriptions for psychotropic drugs are also common in the elderly population, particularly the benzodiazepines; drugs that are used to treat anxiety and insomnia. In fact in Quebec in 1990, 38.8 per cent of elderly received a benzodiazepine.[11] Although long-acting benzodiazepines, and doses in excess of 50 per cent of the maximum adult dose are not advised in the elderly because of the increased risk of falls and fractures,[16,35] 1.21 per cent of Quebec seniors received a long-acting benzodiazepine during the year, and 14.9 per cent of Quebec seniors received benzodiazepine doses in excess of 50 per cent of the maximum adult dose. Using the most conservative estimate of the risk of use, 80 per cent,[16,35] we estimated that 2,918 fractures could be prevented each year as well as 2,482 hospital admissions and emergency room visits for other forms of trauma (e.g., soft tissue injuries). Prevention of avoidable incidents of hip fracture alone could result in a yearly cost saving of 20 million dollars (if it is conservatively assumed that each hip fracture leads to $25,000 in medical, surgical, pharmaceutical and institutional expenditures).[36] Long-term benzodiazepine therapy was the norm in this study population. Ninety per cent of patients who were prescribed a benzodiazepine received therapy for longer than 30 days, the average length of prescribed treatment being 119 days.[37] Although the risk of long-term benzodiazepine therapy has not been well established, problems of habituation, loss of efficacy, and sleep disturbance have been documented to occur within 14 to 30 days of treatment.[38] For this reason, therapy for longer duration is only believed to be indicated in the 1–2 per cent of patients with selected psychiatric disorders.[38]

In sum, potentially inappropriate prescriptions may have a substantial impact on avoidable morbidity and mortality in the elderly population. The challenge in the health care sector is to identify the most cost-effective methods of intervention and to institute policies that support such interventions.

Solutions

Rising costs of prescription drugs have resulted in a number of national and provincial initiatives to identify effective methods of optimizing prescribing and medication use.[39] Intervention at the consumer, physician, and health policy level will likely be required to achieve these objectives; however, physicians are key to the successful implementation of any intervention. Physicians are the gatekeepers to prescription medication access, and in this role, they have the opportunity to prevent exposure to unnecessary and inappropriate medication. This is critical because existing pharmacological evidence suggests that the risk of adverse outcomes with any drug is most

likely within the first few days and weeks of exposure.[17,18] Thus, popular interventions, such as drug utilization review programs which monitor dispensed medication, have the potential to reduce the cost of unnecessary medication but *not* the more significant costs of drug-related morbidity and mortality. Pharmacies play a central role in drug dispensing and patient education. However, pharmacy-based surveillance programs for potentially inappropriate prescribing are limited to detection of potentially inappropriate drug doses and drug interactions (as no clinical history is available).[40,41] Furthermore, refusal to fill a prescription because it is potentially inappropriate is not only disruptive to the doctor-patient relationship[41] but will necessitate the added cost of a return visit to the physician to review alternate forms of therapy. Thus, to reduce the prevalence of inappropriate prescribing and the concomitant consequences of avoidable drug-related morbidity, policy needs to support intervention at the "grass-roots" level: the patient-physician, pharmacist-patient interaction. Global policies to reduce drug consumption and drug costs (co-payments, deductibles, prescribing caps, reference-based pricing) are unlikely to have an impact on the appropriateness of drug therapy decisions for individual patients or the costs of avoidable morbidity.

Effective Interventions to Change Physician Prescribing

Over the past decade, considerable attention has been devoted to the development of intervention programs to improve physician prescribing. Six main types of interventions have been used to modify physician practice: education, practice aids, standards and feedback, one-to-one consultation, and administrative policies.[42] Although the impact of these interventions on patient outcome has never been evaluated, the characteristics of interventions that are effective in changing physician prescribing have been identified. The most effective interventions are those which provide expert advice to physicians in their practice environment, typically through one to one contact of an expert with the physician (academic detailing).[43,44]

Translating Research into Practice – Why Has It Failed?

Despite evidence of efficacy,[44,45] adoption of one-to-one interventions into regular quality control and intervention programs is not in evidence. Thus, we are confronted with a common dilemma: relevant research is not translated into practice. Several limitations can be identified. First, one-to-one interventions are costly to introduce and all interventions require on-going maintenance for continued effectiveness.[46] Second, the feasibility of one-to-one interventions rests on the assumption that the majority of inappropriate prescriptions are attributable to a small number of physicians and only one or two target drugs are a problem. The existing evidence suggests that such assumptions are not valid. Potentially inappropriate prescribing is a problem in all major drug groups.[8,11,47-51] The number of drugs involved

appears to be limited only by the number reviewed by each investigator. In our own study, questionable prescriptions were measured in a sample of 65,349 elderly in three major drug groups. In this study sample 14,121 physicians were represented and half of these physicians (51%) prescribed at least one questionable drug or drug combination. Third, all existing physician-based prescribing interventions make the assumption that the patient has only one prescribing physician, or alternately each attending physician is fully aware of all medications received by a patient. Among the elderly, this assumption is not valid. Using prescription and billing data for 51,587 Quebec elderly in 1990, we estimated that 70 per cent of elderly patients had more than one community-based prescribing physician during the year, and 5 per cent had more than six.[37] Furthermore, one-quarter of all potentially inappropriate drug combinations were created because of contemporaneous prescriptions written by two physicians.[37] For the four high risk combinations listed in Table 2, 29–68 per cent were attributable to two prescribing physicians. These data substantiate earlier speculations about the increased risk of inappropriate prescriptions wih multiple prescribing physicians,[52,53] problems which are accentuated by incomplete medication histories[54] and the difficulty many elderly have in accurately recalling the medication they take.[55] Finally, the target group to whom these interventions would be applied, general practitioners, constitute the largest sector of medical manpower in Quebec; 49 per cent of the 15,236 physicians licensed in Quebec in 1993. The cost of instituting and maintaining one-to-one interventions such as academic detailing at a provincial level would be considerable.

General practitioners have been the most important target population for a number of reasons. First, potentially inappropriate prescribing is more common among general practitioners than specialists.[8,9] In Quebec, in a study of 4,976 physicians, we found that general practitioners were 22 times more likely than specialists to be excessive prescribers of long-acting benzodiazepines,[56] and five times more likely to differentially prescribe more benzodiazepines to females than males.[57] Using blind entry of standardized patients into the office practice of consenting family physicians, we found that the management of two types of high risk prescribing situations were judged unsafe in 20–28 per cent of the 129 visits to community-based family physicians, and 7.5 to 10.3 per cent of the 77 visits to academic family physicians.[58] Second, as the primary providers of medical care, general practitioners are responsible for most of the prescribing in the elderly, the largest group of prescription drug users.[3] In Quebec in 1990, general practitioners prescribed 80 per cent of all drugs dispensed to the elderly by community pharmacies.[11] Most importantly, unlike specialists, primary physicians prescribe medication from many different drug groups in the care of their patients. This is particularly true for elderly patients, where primary physicians may be responsible for refilling prescriptions initiated by specialist and general practitioner colleagues. Fifty-one per cent of elderly patients will be prescribed more than six different medications

Table 3
The prevalence of benzodiazepine exposure in Quebec elderly and the estimated yearly incidence of injury which may be attributable to exposure (assuming a RR = 1.8)

Type of Exposure	*Prevalence in Quebec Elderly*[1]	*Number Exposed per Year*	*Estimated Number of Hospital Admissions Potentially Attributable to Benzodiazepine Exposure/Year*	
	%		*Admission for Fracture*	*Admission for Other Accidents*
Benzodiazepine use	38.8	299,148	2,918	2,482
By length of action				
Short-acting	12.9	99,459	1,153	980
Medium-acting	34.6	266,766	2,671	2,271
Long-acting	12.1	93,291	1,088	925
By average dose				
< half maximum adult dose	23.9	184,269	1,977	1,682
half to full max. adult dose	10.7	82,497	972	826
more than max. adult dose	4.2	32,382	401	341
By duration				
<30 days	3.9	30,069	373	317
31–90 days	20.3	156,513	1,721	1,464
91–150 days	7.0	53,970	654	556
> 150 days	7.6	58,596	706	601

Table 4
The average number of different drug classes and drugs prescribed by specialists and general practitioners for their elderly patients during 1990

Type of Physician	*Number of Physicians*	*Number of Different Drug Classes*		*Number of Different Drugs*	
		Mean ± SD	*Median*	*Mean ± SD*	*Median*
General practitioners	2,539	22.4 ± 11.2	23	43.6 ± 28.0	41
Specialists	2,491	7.3 ± 6.9	6	12.0 ± 13.7	8

during the year,[37] and for this group of patients, general practitioners, in comparison to specialists, prescribe almost five times as many different types of drugs from four times as many different classes (Table 4).

Since there are 20,600 drug products which have been approved for marketing in Canada,[39] it is probably *not realistic* in the 1990s to expect even the most diligent primary physician to keep up to date on all current medications.

Overcoming the Obstacles

It is possible to address these limitations, and yet still retain the elements of academic detailing that have proven to be so successful in optimizing prescribing decisions – personalized, one-to-one feedback and education on prescribing. The Canadian health care system provides the ideal setting for such advances. First, information regularly collected in the Canadian health care system could be used to address the problems of multiple prescribers and incomplete information on drug regimens.[59] Most provinces systematically record information on prescription medications dispensed to the elderly through provincial prescription drug insurance plans, or through pharmacy networks such as those developed in Ontario.[60] The technology is available to permit this information to be accessed by the physician, so they will know what drugs have been dispensed to their patients – both the prescriptions written by themselves as well as by other physicians. Thus, we have the capability to give primary care physicians the information they need to co-ordinate their patient's drug therapy and monitor compliance with medications prescribed. Second, expert decision-making software, used so successfully to enhance adherence to practice guidelines in other aspects of medicine[61,62] could be expanded to support prescribing decisions – the 1990s form of electronic academic detailer. The use of technology offers several advantages. It avoids the costs of an on-going program of expert visits, a program that could only realistically be sustained for a small number of physicians. Sophisticated software can be built to screen a patientís health problems, allergies, and drugs, alert the physician on a patient by patient basis about relevant prescribing problems, and provide expert advice on optimal therapy and follow-up. This means that physicians have the benefit of expert input when they need it for individual patients, for an infinite variety of drug problems, not just those that can be feasibly addressed in an academic detail visit. It also means that potential drug-disease or drug-allergy contraindications can be flagged, and management decisions modified on the spot. This is important because these types of prescribing problems constitute a substantial proportion of potentially preventable drug-related problems,[63] and only the physician has access to information about a patient's health problems. Finally, by exploiting the available technology, expert content can be updated as evidence changes or as new drugs enter the market, allowing the latest information to be immediately applied by physicians in the care of their patients.

Policy Issues

If Canadians are to move in this direction, public and health care policies will need to address three areas. First, computerization of the health sector is central to the development of the electronic academic detailing. Federal and provincial policies supporting computerization in the health care sector are already in evidence. A vision for the future has been defined.[64] What is missing are policies that support the development of the infrastructure, and the related research and development. Second, the utility and benefits of expert decision-making support systems depend on the quality of the content. For the elderly, this is a problem because the very group which is most likely to use prescription drugs – older Canadians with multiple health problems – is precisely the group which is most likely to be excluded from clinical trials of drug effectiveness.[65] This means that expert support systems must rely on clinical judgment rather than empirical information on the risks and benefits of drugs among the elderly. To address this problem, policy related to the requirements for drug approval need to be amended, to require that sufficient evaluation be done among the elderly either as a pre-requisite for approval or as a requirement for immediate post-market follow-up. Third, for prescription data to be accessed from centralized repositories, or community electronic networks, clear guidelines and mechanisms for protecting confidentiality and an individualís right to privacy need to be developed.

Summary

Drug-related illness is a common problem in the elderly. Misuse of medication by seniors and suboptimal prescribing by physicians contribute to potentially avoidable adverse drug effects. Limitations in interventions that have been found to be effective in improving physician prescribing could be overcome by introducing computerized expert decision-making support systems into the offices of practising physicians, and by providing physicians with access to provincial prescription claims files. To support these initiatives, policies need to be instituted to protect confidentiality, to develop the needed infrastructure for computerization in health care, and to improve the quality of knowledge on the risks and benefits of drugs in the elderly.

Notes

1 Prevalence estimates were based on prescription information form the provincial database for a regionally-stratified random sample of 65,349 elderly who made a physician visit in 1990 (all prescriptions during the year), weighted to account for the percent of elderly males and females who do (80–90%) and do not (10–20%) visit the health care system in each geographic region.

2 To estimate attributable risk, we first estimated the incidence of hospitalization for outcomes of interest among persons 65 years of age and older in 1991–1992 using data from the provincial hospitalization database (MED-ECHO). Primary discharge diagnosis was

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used to identify admissions for each of the problems. Prevalence of exposure was estimated from a sample of 65,349 elderly,[1] weighted to account for regional differences in prescribing and health care use. Attributable risk estimates were produced using the prevalence of exposure in Table 2 and 3, the incidence of outcomes in Quebec in 1990–91 and Hennekins formula.[62] These estimates assume that elderly who are dispensed a drug will take some or all of the prescribed dose.

3 Based on prescribing physician and drug information from RAMQ prescription files for 5030 physicians who saw at least 20 patients in a random sample of 65,349 elderly who visited a physician in 1990.

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