

VARIABILITY IN PRESCRIPTION DRUG UTILIZATION: ISSUES FOR RESEARCH

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Abstract • Résumé

The authors report the results of a literature review to identify research issues relating to physician prescribing practices and evaluate the potential for existing Canadian databases to support initiatives to improve prescribing practices. Methodologies such as small-area variation analysis and drug utilization reviews are discussed, and Canadian data sources relating to drug prescribing are assessed. The authors conclude that small-area variation analysis can be used to identify differences in drug utilization rates. A ranking method to identify drugs with the greatest variability in utilization can then be used to establish priorities for further analysis. After statistically significant factors associated with prescribing patterns are identified, intervention and policy formation will be possible. This will involve a more sophisticated integration of existing provincial information sources and the adoption of uniform guidelines to promote rational prescribing practices.

Les auteurs présentent un rapport sur les résultats d'un examen critique qui visait à définir des questions de recherche sur les pratiques d'ordonnance des médecins et à évaluer l'appui que des bases de données canadiennes existantes pourraient accorder à des initiatives afin d'améliorer les pratiques d'ordonnance. Ils discutent de méthodologies comme l'analyse d'écart de secteurs restreints et les études d'utilisation de médicaments, et évaluent des sources de données canadiennes sur l'ordonnance de médicaments. Les auteurs concluent que l'analyse d'écart de secteurs restreints peut servir à repérer des différences au niveau des taux d'utilisation des médicaments. On peut ensuite utiliser une méthode de classement pour identifier les médicaments dont l'utilisation peut varier le plus pour établir les priorités relatives à des analyses plus poussées. Une fois identifiés les facteurs significatifs sur le plan statistique qui sont liés aux tendances des ordonnances, il sera possible d'intervenir et d'élaborer des politiques. Il faudra à cette fin procéder à une intégration plus poussée des sources provinciales actuelles d'information et adopter des lignes directrices uniformes pour promouvoir des pratiques rationnelles d'ordonnance.

In 1993 prescription and over-the-counter drugs accounted for 15.1% of the \$72 billion spent on health care in Canada. Increasing at an annual rate of 8.2% (in contrast to the overall growth in spending of 3.2%) drug costs represented the fastest growing health care expenditure.¹ Several federal and provincial initiatives have been established over the years to contain drug costs; some of these, such as the Patented Medicines Prices Review Board, are unique to Canada. Canada, Australia and Italy are currently the only countries with national phar-

macoeconomic guidelines;² however, the introduction of such guidelines is under consideration in several other countries. Other regulatory mechanisms to control drug prices include legislation governing drug substitution, rules for price selection and formulary restrictions.^{3,4}

When used appropriately, drug therapy is often more cost effective than other kinds of treatment.⁵ However, inappropriate prescribing can cause adverse outcomes, deplete health care resources and compromise the quality of care. Prescribing a drug without an acceptable in-

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dication, specifying an incorrect dosage, schedule or duration of treatment, duplicating therapeutic agents and prescribing drugs without adequate regard to potential interactions are all forms of inappropriate prescribing.⁶ Our review of the literature indicated that these problems are not uncommon. For example, one study revealed that only 60% of antidepressants used by a sample of outpatients were prescribed for actual psychiatric disorders.⁷ An evaluation of ciprofloxacin prescribing in a long-term care setting showed that in 23% of prescriptions ciprofloxacin was prescribed but not indicated, and that in 49% of cases in which ciprofloxacin was prescribed a more effective or less expensive antibiotic was available.⁸ An analysis of ondansetron utilization found that guidelines for schedule and duration were met in only 37.8% of patients for whom injections of the drug were prescribed.⁹ In a retrospective study conducted in Quebec, 45.6% of a sample of elderly patients were found to have received questionable high-risk prescriptions in which therapeutic agents were duplicated or there was a potential for drug interactions.¹⁰

Given the prevalence of inappropriate prescribing, regulatory initiatives such as the Patented Medicines Prices Review Board and pharmacoeconomic guidelines may not be sufficient to contain costs and, more important, ensure high-quality and appropriate medical care. A growing body of evidence in the small-area variations literature suggests that patterns of medical care vary dramatically¹¹⁻¹⁴ and that physicians in different communities use and advocate different medical interventions.¹⁵ One approach to reducing variability in prescribing practices is the drug utilization review, "a formal program for assessing data on drug use against explicit, prospective standards and, as necessary, introducing remedial strategies to achieve some desired end."¹⁶ We reviewed the literature to identify research issues and evaluate potential applications of Canadian drug databases in initiatives to improve prescribing practices. Therefore, we evaluated approaches such as small-area variation analysis as applied to the measurement of prescribing variability, as well as approaches to drug utilization review, informational requirements and the availability of Canadian data sources to support small-area variation analysis and drug utilization reviews.

SMALL-AREA VARIATION ANALYSIS

Small-area variation analysis is used to determine population-based rates, describe patterns of use in a health care region and focus on hospital market areas.^{17,18} The results of such analysis can play a role in policy formulation. The coefficient of variation, which in this context is "the ratio of the standard deviation to the mean of the observed distribution of per-capita rates of use of an

intervention, adjusted for age and sex,"¹⁹ is often used as a measure of variability. The extremal quotient — the ratio of the highest to the lowest measured rate — can also be used as a measure of variability. Even after underlying patterns of disease and other variables such as age, sex, income and insurance coverage are controlled for, differences persist across regions. Although the literature on prescribing practices using small-area variation analysis is not extensive, this methodology can be used to study factors relating to the patient, physician, reimbursement environment or informational requirements that may influence variability.^{10,20-22}

Although it is tempting to explain the variation detected by small-area variation analysis and other methods simply as a random effect, such variation is real and can be characterized in a systematic manner.²³ It requires explanations other than randomness, such as medical uncertainty,²⁴ which can result from a lack or inadequate diffusion of information.¹⁹ Prescribing appears to be irrational when there is a discrepancy between scientific knowledge and physician practice.²⁵ We should bear in mind, however, that determining the efficacy of any specific intervention is a complex task that requires physicians to make inferences from a wealth of available data. Sources of information include medical school training in pharmacology, advertising, peer preferences, the medical literature, patient information and personal experience.^{26,27} To select appropriate evidence for clinical decisions, the physician must be able to appraise the available information critically. Ideally, the physician would be knowledgeable about thousands of disease-related interventions. But no single physician, even with the appropriate training, can be expected to have all relevant information at his or her fingertips, given the economics of information gathering and processing.

DRUG UTILIZATION REVIEW

Retrospective drug utilization review can be used to identify problems in prescribing patterns through the analysis and interpretation of aggregate archival data on drug prescriptions.²⁸ This process has no immediate effect on patient care but can identify trends and prompt intervention.²⁹ Identified problems may be reported by letter to the prescriber weeks or even months after the prescription has been filled.³⁰

Prospective online or point-of-purchase review permits the analysis of both archival and current data. This can have an immediate and direct effect on patient care by detecting problems before a prescription is dispensed. This type of review is based on the professional judgement of pharmacists or on computer-assisted alerts. Prospective drug utilization review in physicians' offices is rare except in the United Kingdom and Japan.

Both retrospective and prospective review systems lack data such as the number, type and severity of diagnoses of the patient. Given the current emphasis on cost-containment, they usually focus on overprescribing. However, underprescribing can also affect the quality of care and has been de-emphasized too often. When pharmacists review a patient's drug use they often infer the diagnosis from the drug prescription. However, because patient characteristics and health status influence prescribing behaviour, assumptions about diagnosis cannot be made on the evidence of prescriptions alone.

Retrospective and prospective drug utilization review both require well-developed implicit and explicit criteria.²⁹ Implicit criteria are based on physicians' expert clinical judgement and their knowledge of the literature. Explicit criteria are found in compendia, texts and research literature. Although explicit criteria may yield more consistent and reliable findings, implicit criteria may also be needed to determine a patient's total clinical status.³⁰ Beers and associates³¹ developed explicit criteria for inappropriate medication use in nursing-home residents, and Kaplan and colleagues³² developed a safety classification system using a consensus process to assess prescribing practices for various nonsteroidal anti-inflammatory drugs. Criteria developed for a drug utilization review may vary according to the drug and population studied. Common features include literature reviews and consensus-derived evaluations. One shortcoming of many drug utilization review systems is an emphasis on evaluating overall drug cost without regard to the effect on the individual patient.

Incorporating new relationships found in retrospective reviews into prospective reviews to target patients at risk at the point of purchase has both advantages and disadvantages.³³ Finally, few rigorous studies have been done to evaluate the effectiveness and, more important, the cost-effectiveness of drug utilization reviews. One study found that drug utilization review programs led to the realization that drug-induced illnesses caused by inappropriate prescribing were more prevalent than had been thought.³⁴

Applying the methods of small-area variation analysis to a drug utilization review process may have certain advantages. It can be used initially to identify differences in rate of drug utilization. A ranking method to identify those drugs with the greatest variability in utilization can then be used to identify which drugs should be given priority for review. After statistically significant factors associated with prescribing patterns have been identified, intervention at the micro level and policy formation at the macro level are possible.

To facilitate priority setting in the assessment of medical practice and medical technologies, Phelps and Par-

ente¹⁵ integrated small-area variation analysis with "a formal and standard economic model of patient well-being" in order to establish an index of gains that might be expected from such assessment. A modified version of these priorities can be applied to the evaluation of inappropriate prescribing. The global loss that results from the misuse of an intervention would be calculated in terms of measures of resource use, the coefficient of variation in use rates across regions and the rate at which the incremental value of a medical intervention changes with its rate of use.

The assumptions of the priority index established by Phelps and Parente¹⁵ can be applied to drug utilization. The first of these is Sutton's law: Go where the money is.¹⁵ In other words, target expensive drugs that may not be used appropriately. The second is Wennberg's corollary: Go where the confusion is greatest.¹⁵ The third is the economist's addendum: Go where the marginal value of therapeutic innovations falls rapidly as those innovations are inappropriately used.¹⁵ Expert panels may be needed to identify inappropriate use, basing their ranking on the frequency and severity of adverse reactions and on other factors that contribute to the overall risk associated with drug therapies. The intent would also be to take patient preferences and the effect of drug use on quality of life into account in the model; here, physicians would act as a proxy for patients.

INFORMATIONAL REQUIREMENTS

We designed a questionnaire to collect information from each Canadian provincial and territorial drug plan about the status and development of its database related to drug prescribing. All provinces and territories completed the survey, with the exception of the Northwest Territories. Incomplete responses were queried by telephone. The survey responses are summarized in Table 1.

Information systems relating to prescription drug utilization vary considerably from province to province. All provinces have databases relating to drug prescribing, many of which were developed to process prescription drug claims. Except for those of British Columbia, Saskatchewan and Manitoba, the databases collect prescription data on elderly people and social-assistance recipients only.

The most important types of data in provincial information sources were:

- prescriber data: physician identification number, type of visit, date of visit, physician specialty and patient diagnosis
- patient data: age, sex, and in some databases, address
- dispenser data: prescriptions dispensed, including drug identification number, type of drug and dosage
- billing data: unit cost.

All provinces except Alberta and Prince Edward Island had prescribing, dispensing, patient and billing data available. Except in Quebec, data from different databases within a province or territory cannot easily be linked. However, integration of databases (e.g., patient demographic data with physician billing data) is possible using a person's health insurance number. Data can be linked in some provinces using this number if it is re-

ported in all databases. However, some provinces would have to rely on probabilistic linking by the comparison of several fields such as name, address and date of birth. This type of integration requires customized computer programs.

Drug utilization review activities vary across the country. Most provinces have some type of ongoing review activity, pharmacy networks being the primary endeav-

Table 1: Provincial and territorial information sources

Province or territory*	Databases	Type of data	Information included†	Drug utilization review activities	Special project
Yukon	Chronic disease, demographic data, Pharmacare, physician claims	Multiple, linkable	Billing	Retrospective	5-year plan to redesign computer systems
British Columbia, all patients	Hospital separations, long-term care, medical services, Pharmacare, vital statistics	Multiple, linkable	All	Retrospective, optimal drug use	Pharmacy network
Alberta	Alberta Health, Alberta Blue Cross	Multiple, linkable	NA	None	Plans for pharmacy network
Saskatchewan,‡ all patients	Patient registry, cancer registry, hospital separations, mental health services, outpatient prescription drugs, physician services	Multiple, linkable	All	Prospective, retrospective, optimal drug use	Plans for online linkage of health districts
Manitoba, all patients	Registries (patient, physician, vital statistics, psychiatric services, cancer), laboratory data, hospital length-of-stay and separation data, physician services, prescription drug dispensing	Multiple, linkable	All	Prospective, optimal drug use	5-year plan to integrate data from physicians, hospitals, laboratories, nursing homes, nursing stations and pharmacies; drug use management centre proposed
Ontario	Ontario Health Insurance Plan claims, Ontario Drug Benefit Plan claims	Multiple, nonlinkable	All	No formal review	Linkage of community pharmacies with health care providers
Quebec	Banques de données (e.g., fee-for-service and salaried physician billing, prescription drugs)	Single, linkable	All	None	Plans for pilot retrospective drug utilization review
New Brunswick‡	Medical procedure history, drug history file	Multiple, nonlinkable	All	Prospective, retrospective, optimal drug use	None reported
Nova Scotia‡	Physician billing, Pharmacare programs	Single, linkable	All	Prospective, retrospective	None reported
Prince Edward Island§	Physician billing, seniors Pharmacare	Multiple, nonlinkable	NA	None	Plans for pharmacy network and project to link data from hospital admissions and public health records
Newfoundland‡	Newfoundland Prescription Drug Program (using Greenshield data)	Multiple, nonlinkable	All	Retrospective, optimal drug use	None

*No data available for Northwest Territories. Databases cover patients aged 65 years and over and social-assistance recipients only unless otherwise noted.

†Databases comprise prescriber, dispenser, patient and billing information unless otherwise noted. NA = not applicable.

‡Has a drug utilization research initiative.

§Billing data will be available September 1996.

our in many regions. British Columbia recently implemented a province-wide pharmacy network. Centrally linked community pharmacy networks have been in place in Saskatchewan since January 1989 and in Manitoba since July 1994. In New Brunswick all pharmacies are linked centrally online through the ClaimNet system. In Nova Scotia the ClaimNet system is also used with online phones. Most pharmacies in Ontario are hooked up to the Healthnet system. Quebec, although the most progressive in linking capabilities, does not have concurrent drug utilization review programs in place.

Linkage of the various administrative databases is needed to enhance provincial information sources. Survey respondents reported current initiatives to link data or to investigate ways of linking systems. Such initiatives included the integration of databases in different health care sectors. For example, Manitoba has a 5-year plan to integrate data from physicians, hospitals, laboratories, nursing homes, nursing stations and pharmacies. The Yukon Territory will redesign its computer system to link data more efficiently. In future, provincially integrated pharmaceutical information systems will also be able to monitor the number of generic drugs dispensed, the number and volume of drug refills, the use of controlled substances, and the abuse and inappropriate prescribing of drugs.

Information linkage seems to be the key to successful drug utilization review. However, prescribing practices will not change if we rely on the current level and type of review activity. Many review programs concentrate on cost-containment rather than on the quality of the therapeutic regimen.²⁸ The most successful program will be one that includes patient outcomes along with cost-containment policies in its assessment criteria.

CONCLUSION

Variability of prescribing practices is a result of medical uncertainty. To facilitate more rational prescribing, evaluation of factors such as physician and patient characteristics and the efficacy and cost of individual drugs is required. This will involve a more sophisticated integration of existing provincial information sources and the adoption of uniform guidelines.

Describing the various methodologies and research issues related to prescribing variability is a multidisciplinary task. Any successful attempt to correct inappropriate prescribing must bring together people with skills in database and information systems as well as economists, pharmacists, pharmacologists and physicians. Because provincial drug plans are the largest single payers for drugs in Canada, it is essential for plan managers to collaborate with these groups to promote effective prescribing for everyone's benefit.

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