

DOES KNOWLEDGE OF MEDICATION PRICES PREDICT PHYSICIANS' SUPPORT FOR COST EFFECTIVE PRESCRIBING POLICIES?

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ABSTRACT

Background

British Columbia implemented a generic substitution (GS) and Reference Drug Program (RDP) to contain drug expenditures without negatively affecting health outcomes. Years after implementation, these policies remain controversial among physicians.

Objective

To assess British Columbia general practitioners' (GPs) opinions of RDP and GS stratified by knowledge of drug costs.

Methods

In telephone interviews, GPs ranked the economic and clinical appropriateness of drug policy options on a 5-point Likert scale. Responses to economic questions were stratified and compared according to the accuracy (\pm \$10 of the actual cost) of GPs' cost estimates for a 30-day supply of atorvastatin and omeprazole.

Results

The majority of 210 interviewed GPs rated the economic appropriateness of GS and RDP positively (79% and 65%) but fewer rated them clinically appropriate (60% and 43%). Ratings for GS were more favorable than RDP, economically (mean=4.3 vs. 3.8, $p=0.0005$) and clinically (mean=3.7 vs. 3.1, $p=0.006$). GP's assessment of the therapeutic equivalence among ACE inhibitors and among CCBs correlated with their ratings of the respective RDPs ($\rho=0.3$, $p=0.03$, and $\rho=0.4$, $p=0.02$). GPs underestimated the price for omeprazole by C\$28 (33%) and atorvastatin by C\$28 (34%). GPs with accurate cost estimates were equally as likely to favorably rank the economic appropriateness of RDP as those with inaccurate estimates (mean = 3.7 vs. 4.0, $p=0.0847$). GS was assessed similarly (mean = 4.2 vs. 4.5, $p=0.0712$).

Conclusions

In British Columbia, the majority of GPs hold favorable opinions of GS and RDP; but, simply educating physicians about drug prices will not make them more supportive of cost-containment policies.

Key Words: *Reference drug pricing; generic substitution; drug costs; British Columbia; survey*

Pharmaceutical benefits organizations commonly implement generic substitution programs, in which a generic drug with bioequivalence to a brand name medication can be substituted for the respective brand name medication, as a means to control costs while at the same time ensuring equivalent clinical effects.¹⁻³ Despite early confusion and misgivings,⁴⁻⁷ physicians and patients are growing more

accustomed to and comfortable with generic substitution programs.⁸⁻¹⁰

In reference drug programs, generic substitution is expanded to therapeutic substitution: medications within a specific reference drug group are assumed to be interchangeable based on the equivalence of their clinical effectiveness and safety.¹¹ The lowest-cost drug within a group of therapeutically equivalent drugs, known as the "reference drug," is fully covered by the benefit plan. Higher-cost, non-reference drugs are reimbursed at the reference drug's cost and the patient pays the difference.¹¹ Reference drug programs reduce the costs to benefit plans and encourage, but do not mandate, that pharmaceutical manufacturers reduce their prices to the reference price.^{12, 13}

Generic substitution policies were introduced to British Columbia in 1994. In October 1995, British Columbia's (BC) drug benefit program for elderly adults, PharmaCare, introduced a reference drug program to the province, commonly known as RDP.¹⁴ BC's RDP came to include five drug categories: non-steroidal anti-inflammatory drugs (NSAIDs), histamine-2 receptor antagonists (H2s), and oral nitrates, all introduced in 1995, and angiotensin-converting-enzyme (ACE) inhibitors and dihydropyridine calcium-channel blockers (dhp-CCBs), introduced in 1997.^{15,16} Controversy plagued RDP before and following implementation.¹⁷⁻²⁰ The most common concerns included whether RDP could correctly identify therapeutically equivalent drugs, whether drug switching and non-adherence might result in poorer health outcomes, and whether the program would increase physician visits and hospitalizations in the wake of prescription changes.^{21,22}

While independent rigorous evaluations have shown that PharmaCare's RDP is both clinically safe and cost-saving,^{15,23-28} it is unclear to what extent BC physicians find RDP acceptable years after its implementation. We undertook a telephone survey among general practitioners in British Columbia, those physicians who were most affected by the RDP, to assess their attitudes towards and beliefs about the clinical and economic appropriateness of generic substitution, RDP (therapeutic substitution), drug costs, and cost control policies and to assess their receptiveness to further expansion of the RDP.

METHODS

The Physician Population

The study involved general practitioners (GPs) actively working in the province of British Columbia, Canada. We excluded those GPs who had a declared subspecialty, or whose practice address was outside the province. For GPs who met study criteria, we then examined their prescribing of angiotensin converting enzyme (ACE) inhibitors, a drug class affected by reference drug policies, for the first six months of 2002. Using PharmaCare claims data, we determined the GPs who had substantial experience with RDP by calculating the mean number of patients who received an ACE inhibitor prescription per GP; the mean was 70 patients per GP. A total of 1,050 GPs were contacted in 2 waves with the goal of interviewing at least 200 GPs. To make the study logistically feasible, ACE inhibitor prescription cut-offs were established such that each wave contained approximately 500 GPs. GPs who had 38 or more patients with an ACE inhibitor prescription received an invitation to participate. Institutional review board approval was obtained from the University of Victoria.

The Introductory Letter and Telephone Survey

A letter was sent to eligible GPs that introduced the purpose of the study and alerted the physicians that research staff would be calling them in approximately 1 to 2 weeks to invite their participation in a telephone survey. These letters were sent in three waves with approximately 500 letters in each wave. Four research staff members, who received training regarding telephone interviewing methods and adherence to the survey language and protocol, initiated telephone calls to all physicians and completed all interviews. Additionally, one staff member monitored random phone calls and provided coaching and feedback based upon each call. Upon reaching a GP by telephone, the interviewer introduced him/herself, explained the purpose of the study, and asked each physician for consent. Each physician was reimbursed C\$60 for his/her time. All interviews occurred between July 2002 and July 2003. The 25-30 minute interview consisted of both open- and close-ended questions covering three main topics: attitudes towards PharmaCare policies, technology use, and drug costs. This study focuses

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on physicians' responses to close-ended questions about 1) specific PharmaCare policies: generic substitution (known as the Low Cost Alternative Program) and RDP, 2) drug costs, and 3) extension of the RDP. The interview survey was developed over a 3-month period, with several physicians answering the survey during a pilot phase. Following these pilot interviews, the survey was revised based on physician feedback.

Economic Appropriateness of PharmaCare's Drug Cost Containment Policies

Several survey questions asked physicians to rate the economic appropriateness of PharmaCare's generic substitution and RDP policies. Responses were recorded on a 5-point Likert scale, ranging from "very inappropriate" to "very appropriate." Each question began with an explanation of the policy concerned and then posed the question. For example, "In an effort to control drug costs, many drug plans use what they call generic substitution. This is where the lowest price, chemically identical, non-branded drugs would be paid in full. How would you rank this in terms of economic appropriateness?" Additional questions concerned GPs' comfort with the expansion of RDP. For example, "Reference Drug Pricing currently applies to only 5 categories of drugs in BC. How would you rate the appropriateness of expanding it to cover other drug classes?"

Clinical Appropriateness of Drug Policies

Questions regarding clinical appropriateness were scored on the same 5-point Likert scale and concerned GPs' clinical judgment regarding generic substitution and RDP. Following questions on the clinical appropriateness of each policy, GPs were asked to rank the clinical equivalence of drugs within two drug classes, ACE inhibitors (enalapril, ramipril, and quinapril) and dihydropyridine calcium channel blockers (dhp-CCBs) (nifedipine, felodipine, and amlodipine). GPs' responses were ranked on a 5-point Likert scale ranging from 1, "not at all equivalent" to 5, "very much equivalent." The interviewers varied the order in which the clinical appropriateness of RDP question and the equivalence of specific drugs within a class question were asked. GPs were also asked their opinion as to whether RDP should be expanded to include other drug classes. Responses were ranked

on a 5-point Likert scale ranging from 1, "very inappropriate" to 5, "very appropriate."

Drug Cost Estimation and Discussions of Costs with Patients and Pharmacists

GPs were also asked to estimate the cost of a 30-day supply of 20mg, once a day, atorvastatin and omeprazole, two of the most commonly prescribed drugs. Responses from GPs who did not wish to provide an estimate were coded as missing. GPs were asked how frequently they discussed economic concerns during their interactions with patients and pharmacists. GPs also ranked the frequency with which they switched patients to a lower cost, equally effective drug. To reflect the range of potential responses, these items were recorded on an 8-point Likert scale: 0, "never or hardly ever" 1, "a few times in the last year" 2, "once a month", 3 "a few times a month", 4 "once a week", 5 "a few times a week", 6 "once a day" and 7, "a few times a day or more."

Statistical Analyses

Mean values were calculated for GPs' responses to clinical and economic appropriateness items; mean responses regarding generic substitution programs were compared to those regarding reference drug programs using two-sided t-tests. Spearman rank sum correlations were used to examine the relationship between GPs' ratings of the equivalence of specific ACE inhibitors (enalapril, ramipril, and lisinopril) and the clinical appropriateness of reference drug programs. We also examined whether the order of the questions affected this relationship. Similar tests were performed for the dhp-CCBs (nifedipine, amlodipine, and felodipine). We calculated the differences in price between the actual cost of a 30-day supply of omeprazole and of atorvastatin, based on prescription cost data from the first 6 months of PharmaCare dispensing data for 2002, and GPs' estimates. Cost estimates were then dichotomized based on the accuracy of the estimate; GPs' estimates within \$10 of the actual cost were deemed "accurate"; those that fell outside this range were deemed "inaccurate." While this dichotomization is arbitrary, we note that \$10 was the co-payment amount that lower-income elderly had to pay for prescription drugs during the period when the interviews were

conducted. Thus, \$10 can be thought of as the amount necessary for a low-income elderly person to procure a drug. Alternately, we dichotomized cost estimates such that GPs' estimates within \$10 of the actual cost or estimates greater than \$10 above the actual cost were deemed "accurate or overestimates" and GPs' estimates that were \$10 or more less than the actual cost were deemed "underestimates." We compared GPs' responses to economic-related items stratified by the accuracy of their cost estimates using both dichotomization methods with Wilcoxon rank sum tests.

RESULTS

Of the 1,050 GPs contacted, 210 agreed to the telephone interview (20% response rate). No demographic data were retained about any of the GPs. Overall, GPs rated the economic appropriateness of generic substitution (87%) and RDP (74%) positively. GPs were less enthusiastic about the programs' clinical appropriateness; 70% approved of generic substitution while 50% approved of RDP. Table 1 presents comparisons of GPs' ratings of the appropriateness of generic substitution versus RDP. In ratings of both clinical and economic appropriateness, GPs rated generic substitution as significantly more appropriate. Correlations between GPs' rankings for the clinical appropriateness of RDP and their rankings of the therapeutic equivalence of ACE inhibitors (enalapril, ramipril and lisinopril) ($\rho=0.3$, $p = 0.03$) and dhp-CCBs (nifedipine, amlodipine, and felodipine) ($\rho=0.4$ $p = 0.02$) were consistent regardless of the order of questions. GPs' support for the expansion of RDP to include other drug classes was moderate, with a mean response of 3.46 ± 1.14 on the 5-point Likert scale.

Forty-three percent of GPs were inaccurate in their cost estimates for both atorvastatin and omeprazole, and 75% of these inaccurate estimates were underestimates of cost. Using GPs' estimates, there was an absolute difference of C\$28 (32%) for omeprazole (true cost C\$85.76) and C\$27 (33%) for atorvastatin (true cost C\$82.82). The median estimate for both drugs was C\$60. The range of cost estimates varied widely, from C\$36 to C\$240/month for omeprazole and C\$30 to C\$210/month for atorvastatin.

Table 2 examines physicians' attitudes about economic concerns stratified by the accuracy of their cost estimates for atorvastatin. GPs that provided accurate atorvastatin estimates were equally as likely as GPs who provided inaccurate estimates to favorably rank the economic appropriateness of generic substitution, RDP, and the expansion of RDP. GPs in both groups also reported discussing cost concerns with patients and pharmacists and with switching patients to lower cost drugs with similar frequency. Comparisons using the accuracy of GPs' estimates for omeprazole showed equivalent results, as did analyses examining GPs' responses based on the "accurate and overestimates" versus "underestimates" dichotomization.

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TABLE 1 Comparison of 208* Physicians' Attitudes Regarding Generic Substitution and RDP

	Generic substitution programs		Reference drug programs	<i>P</i>	
	<i>Mean ± SD</i>				
Program is clinically appropriate**	3.68	± 1.25	3.05	± 1.30	0.0064
Program is economically appropriate**	4.25	± 0.90	3.79	± 0.96	0.0005
Program should be expanded**	--	--	3.56	± 1.14	--

*Two physicians who participated in the telephone interviews did not answer these questions.

**Responses were measured on a 5-point Likert scale, ranging from 1, "very inappropriate" to 5, "very appropriate."

TABLE 2 Physicians' comfort with the economic appropriateness of generic substitution and RDP and with related economic concerns stratified by the accuracy of their atorvastatin cost estimates

	Accuracy estimate of atorvastatin cost (actual cost ± < \$10)	Inaccurate estimate of atorvastatin cost (actual cost ± > \$10)	<i>P</i>
	<i>Mean ± SD</i>		
Generic substitution is economically appropriate*	4.14 ± 1.01	4.50 ± 0.54	0.0712
RDP is economically appropriate*	3.64 ± 1.05	4.06 ± 0.70	0.0769
Economic appropriateness of expanding RDP to include more drug classes*	3.59 ± 1.14	3.78 ± 1.13	0.2468
Frequency with which cost of medication is discussed with patient [†]	5.33 ± 2.50	5.36 ± 2.40	0.9305
Frequency with which physician switches patient to a lower cost drug [†]	4.57 ± 2.21	4.60 ± 2.10	0.9453
Frequency with which physician discusses cost concerns with pharmacist [†]	3.27 ± 2.19	3.44 ± 2.14	0.7532

*Responses were measured on a 5-point Likert scale, ranging from 1, "very inappropriate" to 5, "very appropriate."

[†]Responses were measured on an 8-point Likert scale, ranging from 0, "never or hardly ever" to 7, "a few times a day or more."

DISCUSSION

In telephone interviews, a majority of GPs expressed positive attitudes and beliefs about RDP from both clinical and economic perspectives. Most GPs (74%) endorsed the economic appropriateness, while half of GPs felt comfortable with the clinical appropriateness of the program. Still, GPs' comfort with RDP was less than their comfort with the generic substitution program. GPs underestimated the costs for a 30-day supply of two commonly used drugs, atorvastatin and omeprazole, with the variance in estimates suggesting that at least 43% had limited, if any, knowledge of drug costs. GPs with inaccurate atorvastatin estimates were equally as likely as those with accurate estimates to hold favorable opinions of generic substitution and RDP. Omeprazole cost estimate accuracy similarly had no effect on the frequency with which a GP discussed cost concerns with patients or pharmacists, or the frequency with which the GP changed a prescription due to cost concerns.

During the two-year span in which RDP was introduced and expanded in British Columbia, GPs were exposed to commentaries that both advocated for continued expansion and demanded the program's termination.^{14,17-20,22,29} This controversy persisted over time, despite empirical evidence available during the time the interviews were completed.^{15,23,25} Evidence suggested that the RDP program had appropriately identified therapeutically equivalent drugs, and that RDP prompted a temporary increase in physician visits to switch medications but no negative clinical consequences such as a sustained increase in physician visits, increased hospitalizations, or higher rates of gastrointestinal bleeding. Given the strong clinical evidence available at the time of the interviews, the fact that only half of physicians felt RDP was clinically appropriate is worthy of further study.

Economic cost savings were also publicized before or at the time during which our interviews were conducted. Between 1996 and 2000, PharmaCare saved \$138 million in the 5 drug classes covered by reference drug programs.²⁰ The impact of RDP on cost savings is reflected in GPs' beliefs about the economic appropriateness of reference drug programs, with 74% expressing favorable attitudes. BC GPs' limited knowledge

of drug costs for atorvastatin and omeprazole compare similarly with that of other physicians in alternate settings.^{7,30-37} Over 80% of physicians who specialized in pain medicine or orthopaedics agreed that cost was an important factor in deciding which NSAID to prescribe, but only 38% were able to reasonably estimate prices for the most commonly prescribed NSAIDs, and 65% underestimated the cost of the NSAID they prescribed most frequently.³⁰ In another study, 71% of primary care physicians were willing to consider altering their prescribing to lessen the economic burden on their patients, but 80% reported poor knowledge of drug costs.³⁸ Analogous to BC GPs' responses, these primary care physicians' cost estimates were accurate in only 45% of cases and too low in 40%. A follow-up study that examined these physicians' knowledge and behaviors after a brief, interactive educational lecture found that knowledge of drug costs improved, but underestimates were still common.³⁹ A recent systematic review of physicians' awareness of drug cost found that average estimation accuracy of drug cost across studies was less than 50%, with frequent overestimation of the cost of inexpensive drugs and underestimation of the price of expensive drugs.⁴⁰

Several current initiatives in physician education aim to educate physicians about drug costs, often in addition to other aims.⁴¹⁻⁴³ The inclusion of this objective is based on the premise that if physicians are aware of and sensitized to drug costs, they will be more likely to "do the right thing" and consider cost, in addition to efficacy and safety, when prescribing; however, there has been little research in this area. In one study, a patient's primary payment source influenced physicians' prescribing behavior: physicians were three times as likely to consider cost when prescribing to a patient who was self-pay (94% of physicians) than they were when drug costs were covered by an HMO or by Medicaid (30% of physicians).³⁸ An intervention among these physicians was not able to change their beliefs regarding the need to balance efficacy with affordability nor their willingness to use generics.³⁹ Physicians reported exercising their prescribing privileges differently based on the circumstances of each patient, not based on broader economic principles or drug plan-

implemented policies. BC GPs similarly might alter their prescribing for individual patients and at the same time be resistant to changing their attitudes about broader economic policies imposed by the provincial government. Therefore, it is unlikely that single point-of-contact interventions can address physicians' needs for readily accessible, up-to-date information about drug costs within the context of a particular patient.

One tool that may help GPs manage individual patients' medications and cost concerns is e-prescribing, in which a physician uses a hand-held electronic device, personal computer or an electronic medical record to issue prescriptions rather than handwriting the prescription. E-prescription software can provide GPs with information about medication interactions, formularies, drug prices, generic availability, and reference drug/preferred drug status within particular health insurance plans. E-prescribing software updates regularly to reflect drug price, generic availability, and formulary changes, thus obviating the need for GPs to memorize this information, and instead providing it in a readily accessible, patient-specific, easy-to-use format. By linking individual patient-specific data and the drug information a GP needs to make prescribing decisions within easy reach, e-prescribing offers a efficient mechanism to address individual patient and broader healthcare program needs.

The British Columbia Medical Association has long endorsed e-prescribing and government funding of e-prescribing initiatives.⁴⁴ The British Columbia Ministry of Health, in partnership with Canada Health Infoway, is currently involved in a C\$134 million project to provide e-health records for 50% of the Canadian population by 2009.⁴⁵ This initiative includes e-prescribing software that will enable GPs to view PharmaCare benefit status and other cost variables.⁴⁶ With progressive implementation of e-prescribing capability in British Columbia, GPs will have the tools they need to make the best clinical and economic decisions for individual patients as well as informed economic decisions within the context of the larger generic substitution and reference drug programs. The decisions GPs make will provide further data regarding the integration of cost considerations in clinical practice. Our study had several limitations. We had a modest response

rate to our interviews. While typical for interview studies with physicians, these results may not be generalizable to all BC GPs. The study was conducted among physicians who prescribed a significant number of ACE-inhibitor prescriptions; however, no demographic data was available for GPs, so we cannot determine to what extent responders to the telephone interview differed from those who did not respond. Our focus on GPs also limits the generalizability of these findings to other settings or physician specialties. The small sample size may have limited our ability to detect differences among the groups, particularly among those who provided accurate drug cost estimates and those who did not. However, results from previous studies indicated that physicians' cost estimates were not associated with their individual or practice characteristics.^{36,37}

Eight years after the implementation of reference drug programs, the majority of BC GPs interviewed hold positive opinions of both generic substitution and reference drug programs. Most were also favorably disposed to the expansion of the programs to include other drug classes. Notably, GPs with accurate drug cost estimates for two commonly prescribed medications did not express significantly different beliefs about generic substitution, RDP, or the frequency with which cost concerns affected their prescribing decisions. These findings cast doubt on the simplistic hypothesis that informing physicians about drug prices will make them more supportive of cost-containment policies. A GP's knowledge of drug costs and his/her beliefs about the role cost should play in the prescribing decision may be quite distinct and have little influence on the other. The advent and dissemination of e-prescribing in BC will link patient's clinical information and economic status with the economic principles of the larger BC healthcare system. By observing GPs' decision-making within this new context, more informed decisions might be made regarding physician education, policy refinement, and the future direction of PharmaCare programs.

Conflict of Interest Disclosure

Dr. Schneeweiss has received unrestricted research funding from Merck and Pfizer in the past unrelated to the current study.

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