

# Therapeutic Interchange in Canadian Hospitals: A National Survey

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## ABSTRACT

**Background:** Therapeutic interchange has been a common element of hospital pharmacy practice for many years. Recent annual surveys have shown a stable prevalence of this practice in Canadian hospitals, despite its apparent incompatibility with patient-focused care. However, these surveys have not fully described therapeutic interchange programs.

**Objectives:** To determine the prevalence of therapeutic interchange programs in Canadian hospitals, the reasons for their existence, the drug categories typically selected for the programs, the procedures used, and pharmacists' perception of the appropriateness of therapeutic interchange in Canadian hospitals.

**Methods:** A 12-item questionnaire was mailed, in the first quarter of 1999, to 255 hospitals listed in the Canadian hospital pharmacy directory as having more than 100 beds. The mailing of the questionnaire was preceded by an introductory letter and followed by up to 3 reminder letters.

**Results:** A total of 211 eligible responses were received (83% response rate). Of these respondents, 186 (88%) reported having a therapeutic interchange program. Cost containment (at 178 [96%] of the 186 hospitals) and inventory control (at 155 [83%]) were most commonly cited as the bases of the program. Drug categories most frequently included in these programs were antibiotics (168 [90%] of the responding hospitals), antacids and adsorbents (144 [77%]), electrolyte replacement preparations (119 [64%]), gastrointestinal drugs (118 [63%]), vitamins (111 [60%]), and cardiovascular drugs (107 [58%]). Of 164 analyzable responses from hospitals with therapeutic interchange programs, 122 (74%) thought that therapeutic interchange had no effect on patient outcomes, and 199 (94%) of all 211 respondents thought that therapeutic interchange programs were appropriate in today's hospital setting.

**Conclusions:** Therapeutic interchange is common in Canadian hospitals. The primary benefit perceived by hospital pharmacists is financial. The change in pharmacy practice toward patient-focused care does not appear to have influenced the prevalence of therapeutic interchange programs.

**Key words:** therapeutic interchange, mail survey, Canadian hospitals

## RÉSUMÉ

**Historique :** L'interchangeabilité thérapeutique est devenue un élément commun de l'exercice de la pharmacie d'hôpital depuis de nombreuses années. De récents sondages annuels ont montré la prévalence stable de cette pratique dans les hôpitaux canadiens, malgré son apparente incompatibilité avec les soins axés sur les patients. Toutefois, ces sondages n'ont pas décrit les programmes d'interchangeabilité thérapeutique dans leur totalité.

**Objectifs :** Déterminer la prévalence des programmes d'interchangeabilité thérapeutique dans les hôpitaux canadiens, les raisons pour lesquelles ils existent, les classes de médicaments typiquement sélectionnés pour ces programmes, les marches à suivre utilisées et la perception des pharmaciens de la pertinence de l'interchangeabilité thérapeutique dans les hôpitaux canadiens.

**Méthodes :** Un questionnaire comportant 12 rubriques a été posté au premier trimestre de 1999 à 255 hôpitaux de 100 lits ou plus, tels que décrits dans le Répertoire des pharmacies d'hôpitaux du Canada. L'envoi des questionnaires a été précédé d'une lettre de présentation, puis d'au plus trois lettres de rappel.

**Résultats :** En tout, 211 répondants admissibles ont retourné le questionnaire (taux de réponse de 83 %). Des répondants, 186 (88 %) ont déclaré avoir un programme d'interchangeabilité thérapeutique. La compression des coûts (178 [96 %] des 186 hôpitaux répondants) et le contrôle des stocks (155 [83 %]) ont été le plus souvent rapportés comme étant la raison justifiant le programme. Les classes de médicament les plus souvent incluses dans ces programmes étaient les antibiotiques (pour 168 [90 %] des hôpitaux répondants), les antiacides et les adsorbants (144 [77 %]), les préparations de rééquilibration hydroélectrolytiques (119 [64 %]), les médicaments pour les affections gastro-intestinales (118 [63 %]), les vitamines (111 [60 %]) et les médicaments cardiovasculaires (107 [58 %]). Des 164 réponses analysables reçus des hôpitaux qui avaient un programme d'interchangeabilité thérapeutique, 122 (74 %) croyaient que l'interchangeabilité thérapeutique n'avait aucun effet sur l'issue des traitements et 199 (94 %) des 211 répondants croyaient que les programmes d'interchangeabilité thérapeutique étaient pertinents dans les milieux hospitaliers d'aujourd'hui.

**Conclusion :** L'interchangeabilité thérapeutique est courante dans les hôpitaux canadiens. Le principal avantage observé par les pharmaciens d'hôpitaux est d'ordre financier. L'évolution de l'exercice de la pharmacie vers les soins axés sur les patients ne semble pas avoir influé sur la prévalence des programmes d'interchangeabilité thérapeutique.

**Mots clés :** interchangeabilité thérapeutique, sondage postal, hôpitaux canadiens



## INTRODUCTION

Therapeutic interchange has been defined as “the act of dispensing a therapeutic alternate for the drug product prescribed. A therapeutic alternate is a drug product that contains a different therapeutic moiety than the drug in question but is of the same pharmacological or therapeutic class and can be expected to have a similar therapeutic effect when administered to patients in a therapeutically equivalent dosage.”<sup>1</sup> Operated under the auspices of a formulary system, therapeutic interchange has been a common element of hospital pharmacy practice in North America for many years. It was first described in the hospital pharmacy literature in the 1970s and today is included in the formulary system standard of practice of both the Canadian Society of Hospital Pharmacists<sup>2</sup> and the American Society of Health-System Pharmacists.<sup>3</sup> The intended benefit of therapeutic interchange is primarily financial. Because therapeutic interchange involves therapeutically equivalent products, its use allows an institution to choose the least costly product and to save on drug inventory costs, product acquisition costs, and, in some cases, administrative costs. Although some studies have demonstrated reductions in expenditures in the target drug category,<sup>4-6</sup> others have documented the unintended consequence of shifting costs to other areas of the drug budget or of the health-care system (resulting from more admissions or longer lengths of stay).<sup>4,7</sup>

In the past decade, however, the focus of pharmacy practice has changed from providing medications to taking responsibility for drug-related outcomes that will improve the patient's quality of life — otherwise known as pharmaceutical care.<sup>8</sup> Under this philosophy of practice, the pharmacist must consider the patient's wishes, preferences, and needs when deciding on appropriate drug therapy. Therapeutic interchange is contrary to pharmaceutical care because it does not recognize the need to individualize drug therapy. It might be predicted, then, that the use of therapeutic interchange programs would be declining. Yet national surveys of pharmaceutical services in nonfederal community hospitals conducted by the American Society of Hospital Pharmacists and its successor, the American Society of Health-System Pharmacists, showed an increase in the proportion of hospitals with therapeutic interchange programs, from 48% in 1990 to 74% in 1996.<sup>9-11</sup> In Canada, annual “Hospital Pharmacy in Canada” surveys over the past decade have shown that the prevalence of therapeutic interchange

programs has been relatively stable over this period, at approximately 80%.<sup>12-14</sup> However, these data should be viewed with caution because response rates have typically been less than 55%. Another drawback to these surveys is that they have not described the practice of therapeutic interchange in Canadian hospitals.

The objectives of this study were to determine the prevalence of therapeutic interchange programs in Canadian hospitals, the reasons for implementing them, the drug categories typically selected for therapeutic interchange, program procedures, and pharmacists' perception of the appropriateness of therapeutic interchange in Canadian hospitals today.

## METHODS

Information about therapeutic interchange programs was gathered by consulting several hospital pharmacy practitioners about the mechanics of program operation and by searching the literature to identify the drug categories typically included.<sup>10-15</sup> A 12-item questionnaire (Appendix 1) was then designed to obtain information that would characterize therapeutic interchange programs in Canadian hospitals. The questionnaire was not pilot tested.

Questionnaires were mailed to directors of pharmacy in Canadian hospitals identified in the 1998/99 hospital pharmacy directory<sup>16</sup> as having at least 100 beds ( $n = 255$ ). The survey was anonymous, in that the identity of the respondent was not known or requested; however, each questionnaire was marked with a code number to identify the hospital, to allow tracking of responses. The survey was exempted from review by the research ethics committee at the authors' institution.

As outlined in recommended procedures for mail surveys,<sup>17</sup> an information letter (first mailing) to inform potential respondents of an upcoming survey was sent on January 7, 1999, 1 week before distribution of the questionnaire (second or main mailing). A reminder letter (third mailing) was mailed approximately 12 to 14 days later, to hospitals that had not returned a completed survey. A second reminder (fourth mailing) was sent 3 to 4 weeks after the main mailing. The final mailing (fifth mailing), sent 5 weeks after the main mailing, included a reminder and a second copy of the questionnaire.

Responses on returned questionnaires were coded and double-entered into a relational database (Microsoft Access 97). Descriptive statistics were calculated by means of Excel 97 software.



## RESULTS

Of the 255 questionnaires sent, 212 were returned by March 31, 1999. One questionnaire was excluded from further analysis because it originated from a hospital with fewer than 100 beds. Thus, 211 completed questionnaires were suitable for analysis (response rate 83%). The response rates by province ranged from 63% to 100% (Table 1).

Of the 211 hospitals for which responses were received, 186 (88%) had a therapeutic interchange program. A pharmacy and therapeutics committee was

responsible for implementation of 175 (94%) of these 186 programs. Table 2 summarizes the characteristics of these programs. A total of 178 respondents (96%) reported that cost containment was the primary reason for program implementation; however, at only 29 (16%) of these 178 hospitals was pharmacist time factored into the overall cost savings of the program.

The drug categories most frequently included in the therapeutic interchange programs were antibiotics, antacids and adsorbents, replacement preparations, miscellaneous gastrointestinal drugs, vitamins, and cardiovascular drugs (Table 3).

**Table 1. Survey Distribution, Response Rate, and Reported Prevalence of Therapeutic Interchange Programs**

Province	No. of Surveys Sent	No. (and %) of Surveys Returned	No. (and %) with Therapeutic Interchange
British Columbia	37	33 (89)	30 (91)
Alberta	27	26 (96)	24 (92)
Saskatchewan	10	10 (100)	6 (60)
Manitoba	9	9 (100)	9 (100)
Ontario	88	74 (84)	73 (99)
Quebec	54	36 (67)	24 (67)
New Brunswick	9	9 (100)	7 (78)
Nova Scotia	10	7 (70)	7 (100)
Prince Edward Island	2	2 (100)	1 (50)
Newfoundland	8	5 (63)	5 (100)
Total*	254	211 (83)	186 (88)

\*In addition, one survey was inadvertently sent to (and returned by) a hospital with fewer than 100 beds. This survey was excluded entirely from the analysis.

**Table 2. Characteristics of Therapeutic Interchange Programs at 186 Canadian Hospitals**

Characteristic	No. (and %) of Hospitals
<b>Program duration (years)</b>	
<5	38 (20)
6–10	71 (38)
11–15	48 (26)
16–20	18 (10)
>20	11 (6)
<b>Basis for program*</b>	
Cost containment	178 (96)
Inventory control	155 (83)
Enhanced patient efficacy	94 (51)
Historical	11 (6)
Other†	25 (13)
<b>Method of informing other health-care providers*</b>	
New written order	125 (67)
Note in medical record	85 (46)
Personal communication	41 (22)
Message left with nurse	7 (4)

\*Percentages do not sum to 100 because more than one response was allowed.

†The most common responses in this category were to increase dispensing efficiency (specifically, reduce phone calls to physicians) and to provide standardized regimens with convenient dosing schedules.

In situations where patients are admitted with medications not on the hospital formulary, 156 (84%) of the 186 hospitals with a therapeutic interchange program permitted patients to use their own medications. Only 18 (10%) of the 186 hospitals routinely explained interchanges to patients.

Table 4 summarizes respondents' perceptions of the impact of therapeutic interchange programs on the institution and on the patient. Although multiple responses were permitted for question 10 (concerning perceived benefits), this was not the case for question 11 (concerning impact on the patient), and indeed it was not logical to select more than one response. Nevertheless, 22 respondents did so. Their responses were excluded from the analysis, and the frequency distribution for perceived impact on patient outcomes encompassed 164 responses only. Overall, the perceived benefit to the hospital was financial, and few respondents perceived a negative impact on patient outcomes (Table 4).

Of the 186 respondents from hospitals with a therapeutic interchange program, 180 (97%) indicated



**Table 3. Drug Categories Included in Therapeutic Interchange Programs**

Drug Category	No. (and %) of Hospitals
Antibiotics	168 (90)
Antacids and adsorbents	144 (77)
Replacement preparations (e.g., K, Fe, Ca)	119 (64)
Miscellaneous GI drugs	118 (63)
Vitamins	111 (60)
Cardiovascular agents	107 (58)
ACE inhibitors	47 (25)
Calcium channel blockers	32 (17)
HMG CoA reductase inhibitors*	18 (10)
β-Blockers	16 (9)
Diuretics	12 (6)
Nitrates*	6 (3)
Insulin	82 (44)
Inhaled corticosteroids	81 (44)
Miscellaneous analgesics and antipyretics	79 (42)
Benzodiazepines	72 (39)
NSAIDs	71 (38)
EENT preparations	66 (35)
Asthma preparations	59 (32)
Antiflatulents	28 (15)
Cough and cold preparations*	13 (7)
Antihistamines*	13 (7)
Anticoagulants	13 (7)
Bowel care products*†	11 (6)
Steroids (oral)	10 (5)
Smooth muscle relaxants	7 (4)
Antifungal agents*	6 (3)
Other OTC agents*	5 (3)
Miscellaneous agents‡	9 (5)

GI = gastrointestinal; ACE = angiotensin-converting enzyme; HMG CoA = 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitors; NSAID = nonsteroidal anti-inflammatory drug; EENT = eyes, ears, nose, throat; OTC = over-the-counter.

\*Written in by respondents.

†Includes laxatives, stool softeners, and antidiarrheal agents.

‡Includes blood derivatives, topical steroids, and all other categories written in by respondents.

that such programs are “appropriate” in today’s hospital setting. Of the 25 respondents from hospitals currently without a therapeutic interchange program, 19 (76%) felt that such programs were appropriate.

## DISCUSSION

This survey indicates that therapeutic interchange programs are a standard element of hospital pharmacy practice in Canada. Eighty-eight percent of responding hospitals had an interchange program. Moreover, the fact that 38 (20%) of the programs had been implemented within the previous 5 years suggests that they continue to be valued by hospital decision makers. The prevalence of therapeutic interchange programs reported in this survey is higher than the 80% reported for the 1997/98 “Hospital Pharmacy in Canada”

**Table 4. Perceptions of Therapeutic Interchange Programs**

Benefit or Impact	No. (and %) of Hospitals
<b>Perceived benefit (n = 186)*</b>	
Inventory control	167 (90)
Cost containment	166 (89)
Enhanced patient efficacy	72 (39)
Other†	32 (17)
<b>Perceived impact on patient outcomes (n = 164)‡</b>	
No effect	122 (74)
Improvement	32 (20)
Slight negative impact	10 (6)
Significant negative impact	0 (0)

\*Percentages do not sum to 100 because more than one response was allowed.

†The most common response in this category was increased dispensing efficiency (specifically, fewer phone calls to physicians).

‡Only 164 responses were suitable for analysis.

survey.<sup>14</sup> Our data are more current and likely more representative of Canadian hospitals of 100 beds or more, given that our response rate was 83% (211/255), whereas that of the earlier survey was only 45% (122/271).

The drug category most commonly included in therapeutic interchange programs was antibiotics. When initially described in the literature, therapeutic interchange programs focused on antimicrobial products, which were often overused and for which equally effective cheaper alternatives were available.<sup>1,18</sup> The next most frequently reported drug categories in this survey were antacids and adsorbents, replacement preparations, miscellaneous gastrointestinal drugs, and vitamins. This result is not surprising, as a large number of products are available in each of these categories and large quantities are used; presumably, hospitals can obtain competitive contract prices when one product is chosen to represent a category. Thus, these agents offer the greatest potential for savings through therapeutic interchange. Cardiovascular drugs such as β-blockers, calcium channel blockers, and angiotensin-converting enzyme inhibitors were less frequently reported. Although drugs within these classes may have similar pharmacological effects, equivalent doses may not be as easily defined and cost differences between products may not be as great.

The concept of therapeutic interchange was developed as a result of restrictions on formularies, expansion of the number of marketed drugs, recognition of redundancy across products, and the need to rationalize drug therapy in view of increasing health-care costs. Thus, it is not surprising that respondents



cited cost containment and inventory control as the primary reasons for their programs.

Only 16% of the hospitals that cited cost containment as a main reason for the development of a therapeutic interchange program indicated that the pharmacist's time was considered in overall cost analysis; however, the implications of this low proportion are not clear. It could indicate that few hospitals or pharmacies evaluate their therapeutic interchange programs by doing cost analyses. It might also indicate that cost impact analyses, when done, are incomplete. Therapeutic interchange programs save pharmacist time, in that the physician does not have to be contacted when a nonformulary item is ordered; however, they also consume pharmacist time, because new orders must be written for the interchange drug, the interchange must be documented in the chart, the interchange must be explained to the patient in cases where it involves a preadmission drug, a review must be developed for the pharmacy and therapeutics committee, and all staff must be educated regarding the interchange. Therefore, it is important that evaluations of therapeutic interchange programs include all potential impacts on the pharmacist's time. They should also consider any impact on nurses and physicians, as well as on other pharmacy staff such as the inventory control clerk.

Although endorsed by many pharmacy organizations, the practice of therapeutic interchange has been the subject of controversy.<sup>3,19,20</sup> The American Medical Association initially opposed the practice, citing concern that interchange or substitution would occur without the knowledge of the prescriber.<sup>21</sup> Later, both the American Medical Association<sup>22</sup> and the American College of Physicians<sup>23</sup> stated that formulary systems and therapeutic interchange programs are acceptable in inpatient settings and selected outpatient settings that have an organized medical staff, an effectively functioning formulary system, and a pharmacy and therapeutics committee. In our survey, we found that most programs had been developed with the support of a pharmacy and therapeutics committee.

Another concern has been that therapeutic interchange might result in less appropriate drug therapy, especially if financial rather than clinical considerations drive decisions.<sup>20</sup> McLean<sup>24</sup> questioned the impact of therapeutic substitution on individual patients after they are discharged from hospital, citing several examples of potential drug-related problems. In our survey, 10 (6%) of the respondents felt that therapeutic interchange had a negative impact

on patient outcomes. In contrast, in a survey of community pharmacists in the United States, over 45% of respondents felt that interchange programs had the potential to negatively affect patient outcomes.<sup>25</sup> The reasons for this discrepancy are unknown; however, differences in drug categories and the procedures for performing interchanges, as well as changes in attitudes in the 8 years since the US survey was done, may be factors. It is interesting to note that a large majority of our respondents felt that therapeutic interchange was appropriate in today's hospital setting.

There were limitations to our survey. Only one questionnaire was sent to each pharmacy department. As such, the survey responses reflect the opinions and position of the person completing the survey, the director of pharmacy or his or her designate, and the policy of the pharmacy department as a whole, but may not be indicative of opinions of hospital pharmacists in general. Another limitation is that, because a previously validated questionnaire could not be located, the authors designed their own survey, but did not pilot test it. In retrospect, there were some problems with the content and wording of the survey. First, it did not inquire about the reasons why an institution did not have a therapeutic interchange program. Second, some of the questions were ambiguous, which reduced the accuracy and interpretability of responses. For example, the question about regular discussion of therapeutic interchange with the patient (question 9) did not distinguish between interchange for medications that patients were taking before admission and interchange for medications first prescribed during the hospital stay. This distinction is important, because switches in medications used only in hospital need not be discussed with the patient, whereas a patient who was taking one angiotensin-converting enzyme inhibitor before admission and is discharged on another because of therapeutic interchange will need some education. The finding that few hospitals had regular discussions with patients may reflect infrequent interchange of preadmission medications or it may reflect pharmacists' inattention to the patient's need for education when the interchange involves a preadmission medication. Similarly, because the question about institutional benefits of therapeutic interchange (question 10) was not phrased in terms of *evidence* of benefit, the responses may have been based purely on opinion.

In conclusion, therapeutic interchange is common in Canadian hospitals. The change in pharmacy practice toward patient-focused care does not appear to have influenced its use. The perception of the overwhelming



majority of hospital pharmacy directors in Canada is that therapeutic interchange is an appropriate component of contemporary hospital pharmacy practice.

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## Appendix 1. Questionnaire on Therapeutic Interchange Programs Distributed to Canadian Hospitals with at least 100 Beds

For the purpose of the survey therapeutic interchange is defined as follows: Therapeutic interchange is the act of dispensing a therapeutic alternate for the drug product prescribed. A therapeutic alternate is a drug product that contains a different therapeutic moiety than the drug in question but is of the same pharmacological or therapeutic class and can be expected to have a similar therapeutic effect when administered to patients in a therapeutically equivalent dosage.\* Examples include interchanging perindopril 8 mg od with lisinopril 20 mg od or nizatidine 150 mg hs with ranitidine 150 mg hs.

1. Is your hospital currently involved in an automatic therapeutic interchange program?
  - Yes (If Yes, please proceed to question 2)
  - No (If No, please proceed to question 12)
2. How many years has the automatic therapeutic interchange program been utilized in your hospital?
  - 0–5 years       6–10 years       11–15 years
  - 16–20 years       greater than 20 years
3. Was the Pharmacy and Therapeutics Committee responsible for the implementation of the program?
  - Yes       No
4. What is the basis of the automatic therapeutic interchange program? (check as many that apply)
  - Cost containment       Inventory control
  - Enhanced patient efficacy       Historical
  - Other (please specify) \_\_\_\_\_
5. If cost containment is included as a basis for the program, is the pharmacist's input time calculated into the overall cost?
  - Yes       No
6. How are other health care providers usually informed of the therapeutic interchange?
  - Personnel communication       Chart note
  - Order written       RN to pass on message
7. What agents are included in your automatic therapeutic interchange program?
  - Antibiotics       Blood derivatives
  - Anticoagulants       NSAIDs
  - Misc. analgesics and antipyretics       Benzodiazepines
  - Replacement preparations (K, Fe, Ca etc.)       EENT preparations
  - Antacids and adsorbents       Antiflatulents
  - Misc. GI drugs       Steroids (oral)
  - Steroids (topical)       Insulin
  - Smooth muscle relaxants (ex theophylline)       Vitamins
  - Cardiovascular agents       Asthma preparation
  - ACEI       Inhaled corticosteroids
  - CCB
  - BB
  - Diuretics
  - Other (please specify): \_\_\_\_\_
8. For patients admitted to hospital on medications not on the hospital formulary, is the option available for the patient to use their own home medication?
  - Yes       No
9. Are automatic therapeutic interchanges explained and discussed with the patient on a *regular* basis?
  - Yes       No
10. What benefit has the automatic therapeutic interchange program provided in your hospital setting? (check as many that apply)
  - Cost containment       Inventory control
  - Enhanced patient efficacy
  - Other (please specify) \_\_\_\_\_
11. What impact do you feel automatic therapeutic interchange has on the patient?
  - Improves patient outcome       Slightly negative impact
  - Significant negative impact       No effect on patient outcome
12. Do you feel automatic therapeutic interchange is appropriate in today's hospital setting?
  - Yes       No

***Thank you for your time.***

RN = registered nurse; NSAID = nonsteroidal anti-inflammatory drug; EENT = eyes, ears, nose, throat; GI = gastrointestinal; ACEI = angiotensin-converting enzyme inhibitor; CCB = calcium channel blocker; BB =  $\beta$ -blocker.  
\*Definition of Rich.<sup>1</sup>

