

Chapter 12: Secondary prevention after acute myocardial infarction in four Canadian provinces, 1997–2000

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BACKGROUND: Publication of population-based analyses of medication use after acute myocardial infarction (AMI) could encourage the use of effective secondary prevention medications.

OBJECTIVE: To describe outpatient use of beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, statins, calcium channel blockers and nitrates in elderly survivors of AMI over the fiscal years from 1997/98 to 1999/2000 in Nova Scotia, Quebec, Ontario and British Columbia.

METHODS: Linked administrative databases were used to identify all AMI patients 65 years of age or older admitted in Quebec (n=14,880), Ontario (n=28,647) and British Columbia (n=7549) over the study period, and to measure 90-day postdischarge utilization rates of cardiac medications for these patients. A population-based clinical registry was used to measure rates of prescription at discharge for elderly patients in Nova Scotia admitted to an acute care hospital from 1997 to 2000 (n=1997).

RESULTS: Utilization rates for beta-blockers, ACE inhibitors and statins increased over time, while rates for calcium channel blockers and nitrates decreased only slightly. The largest increases were for statins (Nova Scotia: 26% to 42%, Quebec: 27% to 43%; Ontario: 28% to 40%; British Columbia: 30% to 42%) and for ACE inhibitors in Ontario (55% to 65%) and Nova Scotia (46% to 68%). Of the three drugs recommended for secondary prevention, overall utilization rates for beta-blockers were highest in Nova Scotia, lowest in British Columbia, and similar in Quebec and Ontario. Rates for ACE inhibitors were highest in Ontario and similar in Quebec, Nova Scotia and British Columbia. Rates for statins were slightly higher in Quebec and British Columbia than in Ontario and Nova Scotia. The proportion of patients without a prescription for any of the recommended drugs was highest in British Columbia (20%), lowest in Nova Scotia (8%), and similar in Quebec and Ontario (Ontario: 12%; Quebec: 13%). There was marked regional variation in utilization rates within the four provinces.

CONCLUSIONS: Although utilization rates for recommended cardiac medications are increasing over time, there remains room for improvement. Overall utilization rates and temporal trends are generally similar in all four provinces, but there are wide regional variations within provinces.

Key Words: Administrative databases; British Columbia; Canada; Medication; Myocardial infarction; Nova Scotia; Ontario; Quebec; Registry; Secondary prevention

La prévention secondaire après un infarctus aigu du myocarde dans quatre provinces canadiennes entre 1997 et 2000

HISTORIQUE : La publication d'analyses démographiques sur l'utilisation de médicaments après un infarctus aigu du myocarde (IAM) pourrait favoriser l'utilisation de médicaments de prévention secondaires efficaces.

OBJECTIF : Décrire l'usage de bêtabloquants, d'inhibiteurs de l'enzyme de conversion de l'angiotensine (ECA), de statines, d'inhibiteurs calciques et de nitrates en clinique externe chez les personnes âgées ayant survécu à un IAM au cours des exercices financiers 1997-1998 à 1999-2000 en Nouvelle-Écosse, au Québec, en Ontario et en Colombie-Britannique.

MÉTHODOLOGIE : Des bases de données administratives reliées ont été utilisées pour repérer tous les patients de 65 ans ou plus ayant subi un IAM et hospitalisés au Québec (n=14 880), en Ontario (n=28 647) et en Colombie-Britannique (n=7 549) pendant la période de l'étude et pour mesurer leurs taux d'utilisation de médicaments cardiaques 90 jours après leur congé hospitalier. Un registre clinique démographique a été utilisé pour mesurer les taux de prescription au congé chez les personnes âgées de Nouvelle-Écosse hospitalisées entre 1997 et 2000 (n=1 997).

RÉSULTATS : Les taux d'utilisation de bêtabloquants, d'inhibiteurs de l'ECA et de statines augmentaient au fil du temps, tandis que ceux d'inhibiteurs calciques et de nitrates ne diminuaient que légèrement. Les augmentations les plus importantes s'observaient avec les statines (Nouvelle-Écosse : 26 % à 42 %, Québec : 27 % à 43 %, Ontario : 28 % à 40 %, Colombie-Britannique : 30 % à 42 %) et les inhibiteurs de l'ECA en Ontario (55 % à 65 %) et en Nouvelle-Écosse (46 % à 68 %). En ce qui a trait aux trois médicaments recommandés pour la prévention secondaire, les taux d'utilisation globaux de bêtabloquants étaient les plus élevés en Nouvelle-Écosse, les plus faibles en Colombie-Britannique et demeuraient similaires au Québec et en Ontario. Les taux d'inhibiteurs de l'ECA étaient les plus élevés en Ontario et demeuraient similaires au Québec, en Nouvelle-Écosse et en Colombie-Britannique. Les taux de statines n'étaient que légèrement plus élevés au Québec et en Colombie-Britannique par rapport à l'Ontario et à la Nouvelle-Écosse. La proportion de patients ne disposant d'aucune ordonnance pour l'un des médicaments recommandés était la plus élevée en Colombie-Britannique (20 %), la plus faible en Nouvelle-Écosse (8 %) et demeurait similaire au Québec et en Ontario (Ontario : 12 % et Québec : 13 %). Les taux d'utilisation au sein des quatre provinces s'associaient à des variations régionales marquées.

CONCLUSIONS : Bien que les taux d'utilisation de médicaments cardiaques recommandés augmentent au fil du temps, il y a place à l'amélioration. Les taux d'utilisation globaux et les tendances temporelles sont similaires dans les quatre provinces, mais on remarque une importante variation régionale au sein de chaque province.

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Due to recent advances in the treatment of acute myocardial infarction (AMI), approximately 85% to 90% of AMI patients survive their initial hospitalization (1). Nevertheless, these survivors are at high risk for cardiac death or a second infarction. Several clinical trials have investigated whether certain medications are efficacious for secondary prevention after AMI. Current practice guidelines based on the evidence from these trials recommend that all patients without contraindications be treated with acetylsalicylic acid, beta-blockers and angiotensin-converting enzyme (ACE) inhibitors (2-4). Recent trials have also shown that the cholesterol-lowering statin drugs are beneficial for secondary prevention (5-10). In contrast, there is no evidence to support the routine use of calcium channel blockers post-AMI, and nitrates are recommended only for patients with specific indications. In light of this evidence, a Canadian Cardiovascular Outcomes Research Team (CCORT)/Canadian Cardiovascular Society consensus panel of physicians and researchers from across Canada recently established a set of minimum 'benchmark' rates of use for the recommended medications in patients without contraindications (11). These target rates are 90% for acetylsalicylic acid, 85% for beta-blockers, 85% for ACE inhibitors and 70% for statins.

Observational studies suggest that many eligible patients are not using the recommended medications despite their proven efficacy. In addition, studies suggest that there are wide regional and interhospital variations in the use of these medications. For example, in 1999, the first Canadian province-wide population-based analyses of the use of cardiac medications in elderly survivors of AMI were published in the *Cardiovascular Health and Services in Ontario: An ICES Atlas* (12). In these analyses it was found that as late as 1996, overall rates of use of beta-blockers and ACE inhibitors were only approximately 50%, while rates of use of statins were only 20%. These rates varied by as much as 15 percentage points across the provincial health regions. Similar rates and regional variations have also been observed in Quebec (13,14). Whether such underuse and variation has persisted over recent years in Ontario and Quebec, or exists in other Canadian provinces, has not been explored at the population level.

To encourage the optimal use of effective therapies for secondary prevention after AMI, it is important that utilization rates for cardiac medications be published as the data become available. Such publication provides physicians with knowledge of their relative performance over time, as well as the opportunity to target quality improvement efforts towards those areas of care shown to have suboptimal performance. Given the potential implications of differences in provincial drug reimbursement policies on medication use, it is also important that data from different provinces be published and compared. This study describes, at the population level, the use of cardiac medications in elderly survivors of AMI over the fiscal years from 1997/98 to 1999/00 in Nova Scotia, Quebec, Ontario and British Columbia. To date, these are the only Canadian provinces that have provided researchers with access to province-wide data on outpatient medication use after AMI.

METHODS

Data sources

The methods used to create the study cohorts were similar in Quebec, Ontario and British Columbia, while different data sources were used in Nova Scotia. In Quebec and Ontario, two comparable cohorts of AMI patients were created using linked

administrative databases. Patients admitted in Quebec with a most responsible discharge diagnosis of AMI (International Classification of Diseases [ICD] – 9th revision code 410) between April 1, 1997 and March 1, 2000 were identified in the Maintenance et Exploitation des Données pour l'Étude de la Clientèle Hospitalière database. Patients admitted with this diagnosis in Ontario during these years were identified in the Canadian Institute for Health Information database. Using unique encrypted health card numbers, the data for each cohort were linked with the drug claims database in the respective province. In Quebec, the drug claims database is called la Régie de l'assurance maladie du Québec. In Ontario, it is called the Ontario Drug Benefit Plan (ODB). These databases contain data on all outpatient prescriptions filled for all elderly (65 years of age or older) individuals who are enrolled in the provincial drug plan, amounting to approximately 97% of elderly individuals in Quebec and 100% in Ontario. Thus, our analyses were restricted to the subset of patients who were 65 years of age or older at the time of admission, and who survived their initial hospitalization for AMI (Quebec: n=19,395; Ontario: n=38,743). As in previous studies (15,16), a number of exclusion criteria were then applied sequentially to ensure the accuracy of the diagnosis of AMI and that the cohort consisted of only patients with a first admission for AMI (Quebec: excluded n=3333; Ontario: excluded n=9333). Additional patients were excluded if they were discharged to long-term care facilities or rehabilitation centres (Quebec: excluded n=642; Ontario: excluded n=763), or if they were not enrolled in the provincial drug plan in Quebec (Quebec: excluded n=540) because prescription claims data are not available for such patients. Following these exclusions, there remained a cohort of 14,880 patients in Quebec and 28,647 patients in Ontario.

Information for AMI patients in British Columbia was obtained from the British Columbia Patient Hospitalization Database using a method similar to that of Quebec and Ontario. This database contains discharge data for all acute care hospital admissions in the province. Using the unique patient identifier, patients from this cohort were linked to the Medical Services Plan database to obtain information on subsequent physician visits. Linkage with PharmaCare provided information on cardiac medication usage for patients aged 65 years or older.

The Improving Cardiovascular Outcomes in Nova Scotia (ICONS) registry (17) was used to create a cohort of elderly AMI patients admitted in Nova Scotia over the study period. All residents of Nova Scotia hospitalized with an AMI (ICD-9 code 410) are candidates for inclusion in this registry. Daily patient lists, sorted by admission ward, are obtained from the admitting or health records departments at all provincial institutions that provide adult medical care. These are scanned and charts are requested on all patients who might possibly be study-eligible. Similarly, lists of patients sorted by discharge diagnosis are obtained from health records departments. All diagnosis types (ie, most responsible diagnosis, primary diagnosis, secondary diagnoses and complications) are requested. Trained nurses and health records professionals abstract up to 450 data items such as hemodynamic measurements, results of investigations and blood work, and interventions including medications and dosages, from each patient. This information is entered into laptops and then downloaded daily into a central registry. This database has collected data from October 15, 1997, to the present time. For the present study analyses, only patients admitted between October 15, 1997, to March 31, 2000, were considered. Following exclusions to ensure the accuracy of the diagnosis of AMI and that the cohort consisted of only patients

TABLE 1
Characteristics of patients aged 65 years and over admitted for acute myocardial infarction in Nova Scotia*, Quebec†, Ontario‡ and British Columbia§, 1997/98-1999/00

	Nova Scotia	Quebec	Ontario	British Columbia
Number of acute myocardial infarction patients	1997	14,880	28,647	7549
Median age in years (interquartile range)	75 (70–81)	75 (70–80)	75 (70–81)	75 (70–81)
Women (%)	45	43	44	40
Comorbidity¶ (%)				
Acute renal failure	NA	5	2	1
Cardiac dysrhythmia	8	20	17	16
Cerebrovascular disease	16	8	5	3
Chronic renal failure	5	10	4	2
Congestive heart failure	30	27	27	23
Diabetes with complications	29	3	3	2
Cancer**	3	3	2	2
Pulmonary edema††	18	2	1	0.5
Shock‡‡	0.3	1	1	1

Data Sources: *Improving Cardiovascular Outcomes in Nova Scotia (ICONS) registry; †Maintenance et Exploitation des Données pour l'étude de la Clientèle Hospitalière (Med-ECHO) database; ‡Canadian Institute for Health Information (CIHI) Discharge Abstract Database; §British Columbia Patient Hospitalization Database; ¶Measured using chart review in Nova Scotia and using ICD-9 codes for secondary diagnoses in Quebec, Ontario and British Columbia. **Data in Nova Scotia have only been collected since Jan 2000; ††In Nova Scotia, calculated as chest x-ray-interstitial edema; ‡‡In Nova Scotia, symptom of cardiogenic shock. NA No available data

with a first admission for AMI (excluded n=293), there remained a cohort of 1997 patients in Nova Scotia.

Statistical analysis

For patients admitted in Ontario, Quebec, and British Columbia, rates of outpatient prescriptions filled for beta-blockers, ACE inhibitors, statins, calcium channel blockers and nitrates within 90 days postdischarge were measured. A 90-day window was chosen to allow a reasonable amount of time for the initiation of secondary prevention therapy. However, for most patients, the first prescription filled postdischarge is usually on the day of discharge (18). Thus, 90-day utilization rates should have captured all discharge prescriptions. For patients admitted in Nova Scotia, rates of discharge prescriptions written for each of the five medications were determined. Thus, utilization rates were measured using prescriptions filled in Ontario, Quebec and British Columbia, and using prescriptions written in Nova Scotia. Acetylsalicylic acid utilization was not studied because it can also be purchased over the counter, therefore rates calculated using insurance claims databases would underestimate actual rates of use.

All analyses were conducted at provincial and health region levels. These health regions are known as Public Health Units in Ontario, régions sociosanitaires in Quebec, District Health Authorities in Nova Scotia, and Health Service Delivery Areas in British Columbia. We calculated the lowest and highest rates, 25th and 75th percentiles, and median rates of use across the regions in the four provinces.

RESULTS

Patient characteristics

The characteristics of elderly patients admitted for AMI during the fiscal years 1997/98 to 1999/00 were similar for three of the four provinces (Table 1). The median age of patients in each province was 75 years. In each province, approximately 40% of patients admitted were women. The proportions of patients with comorbidities were also similar for Ontario, Quebec and British Columbia. One exception was that patients in Quebec were more likely to have renal failure and cerebrovascular disease.

The proportions of patients with chronic renal failure and congestive heart failure in Nova Scotia were similar to those of the other provinces. However, it is likely that the proportions of patients with other comorbidities differ due to differences in data sources (ie, chart reviews versus administrative data) in Nova Scotia.

Provincial-level utilization rates

The utilization rates for beta-blockers, ACE inhibitors, statins, calcium channel blockers and nitrates are presented in Table 2. In all of the four provinces, utilization rates for beta-blockers, ACE inhibitors and statins increased over the fiscal years from 1997/98 to 1999/00. The largest increases were in utilization rates for statins (Ontario: 28% to 40%; Quebec: 27% to 43%; Nova Scotia: 22% to 36%; British Columbia: 30% to 42%). Utilization rates for ACE inhibitors also increased markedly in Ontario (55% to 65%), Nova Scotia (46% to 58%) and British Columbia (49% to 58%), but this increase was not as marked in Quebec (52% to 57%). In contrast, utilization rates for calcium channel blockers and nitrates remained more stable, with only slight decreases in utilization rates in the four provinces.

The median time to the first prescription filled was zero days for beta-blockers, ACE inhibitors and nitrates over the entire study period in both Ontario and Quebec (data not shown). However, the median time to the first prescription filled decreased substantially over the fiscal years from 1997/98 to 1999/00 for statins (Ontario: 37 days to 15 days; Quebec: 19 days to one day). In addition, the median time to the first prescription filled increased over these years for calcium channel blockers in Ontario (five days to 10 days), but not in Quebec (constant at one day).

Of the drugs currently recommended for secondary prevention post-AMI, overall utilization rates for beta-blockers were highest in Nova Scotia and lowest in British Columbia, while rates for statins were highest in Quebec and British Columbia. Ontario had the highest utilization rate of ACE inhibitors. Of the two remaining drugs, utilization rates for calcium channel blockers were slightly lower in British Columbia than in the

TABLE 2

Overall and age/sex-specific 90-day post-discharge utilization rates for beta-blockers, ACE inhibitors, statins, calcium channel blockers and nitrates per 100 acute myocardial infarction patients aged 65 years and older in Nova Scotia*, Quebec†, Ontario‡ and British Columbia§

	1997/98-1999/00						Overall			Total
	Women (age)			Men (age)			1997/98	1998/99	1999/00	
	65-74	75-84	85+	65-74	75-84	85+				
Nova Scotia										
Acute myocardial infarction patients (n)	326	420	160	588	405	98	446	790	761	1997
Utilization rate (%)										
Beta-blocker	81	79	81	84	75	74	76	79	83	80
ACE inhibitor	51	49	59	46	51	54	46	44	58	50
Statin	40	31	8	38	21	12	22	28	36	30
Calcium channel blocker	26	27	30	29	30	32	29	29	28	29
Nitrate	51	57	71	49	59	64	59	55	54	55
Nitrate (nonsublingual only)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Quebec										
Acute myocardial infarction patients (n)	2589	2748	1064	4841	3039	599	4952	5138	4790	14,880
Utilization rate (%)										
Beta-blocker	66	63	52	68	56	46	58	61	68	62
ACE inhibitor	52	57	54	50	54	55	52	51	57	53
Statin	48	28	7	46	28	10	27	35	43	35
Calcium channel blocker	32	37	36	27	38	41	34	33	33	33
Nitrate	75	82	82	73	81	86	79	77	78	78
Nitrate (nonsublingual only)	41	57	67	38	57	69	52	48	48	49
Ontario										
Acute myocardial infarction patients (n)	4813	5509	2267	8661	5911	1486	9480	9500	9667	28,647
Utilization rate (%)										
Beta-blocker	68	61	49	71	58	48	58	61	68	63
ACE inhibitor	59	61	59	57	60	58	55	56	65	59
Statin	46	27	9	44	27	10	28	32	40	33
Calcium channel blocker	34	35	32	29	34	33	35	33	31	33
Nitrate	81	82	80	79	80	80	82	79	79	80
Nitrate (nonsublingual only)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
British Columbia										
Acute myocardial infarction patients (n)	1104	1388	501	2349	1766	441	2508	2471	2570	7549
Utilization rate (%)										
Beta-blocker	64	56	42	64	48	40	51	55	61	56
ACE inhibitor	55	57	51	53	48	52	49	50	58	53
Statin	51	27	7	48	26	10	30	30	42	35
Calcium channel blocker	27	28	26	21	21	24	24	24	24	24
Nitrate	73	75	69	67	61	68	68	69	67	68
Nitrate (nonsublingual only)	43	55	59	33	40	54	44	43	43	43

Data sources: *Improving Cardiovascular Outcomes in Nova Scotia (ICONS) registry; †Maintenance et Exploitation des Données pour l'étude de la Clientèle Hospitalière (Med-ECHO) database and La Régie de l'assurance maladie du Québec (RAMQ); ‡Canadian Institute for Health Information (CIHI) Discharge Abstract Database and the Ontario Drug Benefits Database (ODB); §British Columbia Patient Hospitalization Database and British Columbia Pharmacare database. ACE Angiotensin-converting enzyme; NA No available data

other three provinces, while rates for nitrates were lowest in Nova Scotia.

In the four provinces, there were no marked differences in utilization rates for women and men (Table 2). However, there were age differences, with older patients generally having lower utilization rates for beta-blockers and, in particular, statins. For example, in each of the four provinces, only 19% to 25% of men aged 75 years and older filled prescriptions (Ontario, Quebec and British Columbia) or received prescriptions (Nova Scotia) for statins, while for men aged 65 to 74 years these percentages were between 38% and 48%.

The utilization rates for combinations of recommended cardiac medications are presented in Figure 1. Overall, the frequency of utilization of combinations of medications was similar across the provinces, with the exception of British Columbia having the highest proportion of patients not utilizing any of the medications. The proportion of patients not filling (Ontario and Quebec) or receiving (Nova Scotia) a prescription for any of the recommended medications decreased from 1997/98 to 1999/00, and the proportion of patients only filling/receiving a prescription for one of the recommended medications also decreased over the years (data not

TABLE 3

Summary statistics for ninety-day post-discharge utilization rates for beta-blockers, ACE inhibitors, statins, calcium channel blockers and nitrates per 100 acute myocardial infarction patients aged 65 years and older, across regions in Nova Scotia*, Quebec†, Ontario‡ and British Columbia§

Province	Beta-blocker	ACE inhibitor	Statin	Calcium channel blocker	Nitrate	Nitrate (nonsublingual only)
Nova Scotia						
Lowest use region	74	35	17	12	23	NA
25th percentile	78	50	20	19	45	NA
Median	80	50	24	21	55	NA
75th percentile	83	52	29	35	64	NA
Highest use region	89	57	45	43	78	NA
Quebec						
Lowest use region	52	45	27	21	72	39
25th percentile	59	50	31	31	78	48
Median	63	52	35	33	78	49
75th percentile	65	55	41	38	79	53
Highest use region	71	64	51	47	82	59
Ontario						
Lowest use region	51	48	20	18	66	NA
25th percentile	59	54	24	30	76	NA
Median	61	57	31	33	79	NA
75th percentile	64	60	34	38	83	NA
Highest use region	73	71	45	44	86	NA
British Columbia						
Lowest use region	43	46	23	15	56	25
25th percentile	51	48	30	18	63	39
Median	54	51	33	22	68	41
75th percentile	59	56	37	26	70	46
Highest use region	69	62	43	31	78	55

Data sources: *Improving Cardiovascular Outcomes in Nova Scotia (ICONS) registry; †Maintenance et Exploitation des Données pour l'étude de la Clientèle Hospitalière (Med-ECHO) database and La Régie de L'assurance maladie du Québec (RAMQ); ‡Canadian Institute for Health Information (CIHI) Discharge Abstract Database and the Ontario Drug Benefits Database (ODB); §British Columbia Patient Hospitalization Database and British Columbia Pharmacare database. ACE Angiotensin-converting enzyme; NA No available data

shown). In contrast, there was an increase in the proportions of patients filling or receiving prescriptions for a combination of two or three of the three drugs in these four provinces, and were highest in Nova Scotia.

Regional-level utilization rates

The descriptive statistics for utilization rates for the five cardiac medication classes across regions in Ontario, Quebec, Nova Scotia, and British Columbia are presented in Table 3. Regional level data for utilization rates of the six drug classes in the four provinces studied can be found on the CCORT Web site (www.ccort.ca/secondAMIprev.asp). For each medication class, there was wide variation in utilization rates across regions in the four provinces, ranging from about a 10 to 55 percentage point difference between the minimum and maximum rates. In general, utilization rates for lipid-lowering drugs and calcium channel blockers varied the most across regions in each of the four provinces.

DISCUSSION

In this study, administrative and registry databases were used to describe patterns of use of cardiac medications after AMI across Ontario, Quebec, Nova Scotia, and British Columbia. The results of this study suggest that utilization rates for cardiac medications recommended for secondary prevention after AMI

are increasing over time in Canada. However, there remains room for improvement, because utilization rates for individual medications remain well below the recommended target rates. In addition, approximately 8% to 13% of elderly patients did not fill a prescription for any of the recommended medications within 90 days of discharge. This study also suggests that there is only minimal variation in utilization rates across the four provinces. However, there were some small differences across the four provinces, with higher rates of use of ACE inhibitors in Ontario, higher rates of use of statins in Quebec and British Columbia, and higher rates of use of beta-blockers in Nova Scotia. The proportion of patients not using any of the recommended medications was also lowest in Nova Scotia. Finally, consistent with previous studies (12,14,19), we found marked regional variation in the use of cardiac medications post-AMI across administrative health regions in the four provinces.

Although this study design does not permit determination of the factors contributing to the minimal differences in drug utilization rates across the four provinces, there are a number of potential factors to be considered. For example, each province has a different drug reimbursement policy. In each province, patients are required to pay a different annual deductible before being eligible for coverage (maximum annual deductible in Ontario: \$100 for seniors; Quebec: \$350; Nova Scotia: \$215). In Ontario, patients also pay a dispensing fee that ranges from \$1.99 to \$16.00 for each

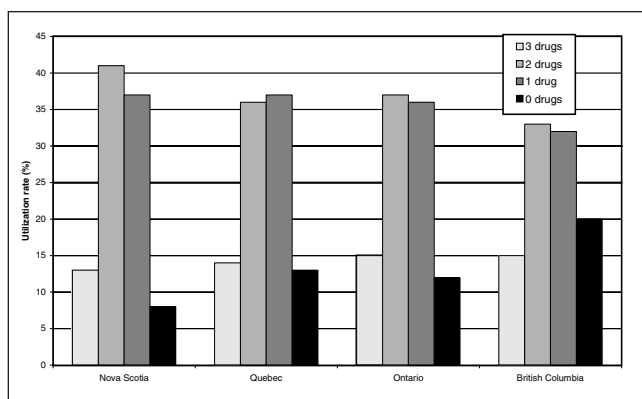


Figure 1) Utilization rates for combinations of recommended cardiac medications in four provinces, 1997/98 to 1999/2000

prescription. In Quebec and Nova Scotia, patients are required to pay a coinsurance fee for each prescription (Quebec: 25% of the cost, with monthly ceilings ranging from \$16.66 to \$62.49; Nova Scotia: 33% of the cost of each prescription, up to an annual maximum of \$350). These coinsurance fees were first introduced in Quebec around the start of the study period (January 1, 1997), but the reform does not appear to have affected postdischarge prescription rates (18). Also of note, the ODB program in Ontario publishes the ODB Formulary/Comparative Drug Index, which serves as a prescribing and reimbursement guide for physicians and pharmacists. It lists those drugs that are covered under the ODB, and identifies those drugs that are defined as interchangeable. This publication has the potential to increase physician prescription patterns since a survey of physicians soon after the delisting of several drugs showed that many would substitute listed drugs for nonlisted drugs, especially for those least able to afford them (20).

Provincial differences in health policy related to quality improvement initiatives may also have contributed to the small differences in utilization rates between the three provinces. As previously mentioned, *Cardiovascular Health and Services in Ontario: An ICES Atlas* (12) was introduced in Ontario in 1999, which could have further influenced physicians' prescribing patterns. However, despite these initiatives, only utilization rates for ACE inhibitors were higher in Ontario than in the other provinces. In Nova Scotia, the ICONS study was launched in October 1997. The aim of this province-wide initiative is to optimize cardiovascular care through a series of quality improvement initiatives, such as formal continuing education programs, audit and feedback through the ICONS Web site, and regional customization of guidelines (17). It is possible that this initiative positively impacted utilization rates for beta-blockers in Nova Scotia.

Interpretative cautions

One limitation of this study is that different methods were used for data collection in Nova Scotia than in Ontario, Quebec and British Columbia. Thus, caution must be taken when comparing utilization rates in Nova Scotia with those of Ontario, Quebec and British Columbia. Nevertheless, each data collection method permitted the observation of drug utilization rates at the population level.

It is important to note that we did not have access to detailed data on patients' contraindications for the medications studied in our administrative databases from Ontario, Quebec and British Columbia. Although beta-blockers, ACE inhibitors and statins are recommended for most post-AMI patients, we were not able to exclude ineligible patients from our analyses. Therefore, we would not expect utilization rates for these medications to reach 100%. The 'benchmark' utilization rates provided earlier in this paper take into account any valid reasons for not receiving a particular medication.

Another caution is that we were only able to study prescriptions that were actually filled by patients admitted in Ontario, Quebec and British Columbia. Similarly, we were only able to study prescriptions that were written in Nova Scotia, but we are unable to determine the number of prescriptions that were actually filled. It is possible that some patients were prescribed an appropriate medication in Ontario, Quebec and British Columbia, but did not fill their prescription. Thus, the prescription rates measured using administrative data cannot be solely attributed to the actual prescribing practices of physicians. It is also possible that some patients received the appropriate medications from other sources, such as if they were enrolled in a clinical trial. However, a previous validation study of the Régie de l'assurance maladie du Québec database in Quebec showed that at least 83% of prescriptions written at a routine internal medicine clinic were filled (21). The proportion of patients who fill their prescriptions following a major health event such as AMI is likely higher. Data from an unpublished chart audit in Ontario suggest that 90% of elderly patients filled a prescription for a secondary prevention medication in the ODB after an AMI in the mid-1990s (personal communication, Peter Austin). In addition, in Nova Scotia, we had access to actual prescribing rates and these were similar to the prescription fill rates at 90 days that were documented using the administrative databases in Ontario, Quebec and British Columbia. However, it is possible that the slightly higher utilization rates for beta-blockers observed in Nova Scotia could in part be accounted for by this discrepancy.

CONCLUSIONS

Although utilization rates for recommended cardiac medications are increasing over time, there remains room for improvement. There is a clear need for a national comprehensive quality improvement initiative for the management of patients with established coronary artery disease to increase the use of ACE inhibitors, beta-blockers and statins.

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