Effectiveness of a program to improve hypertension screening in primary care

Michèle Aubin, MD, MSc, CMFC; Lucie Vézina, MA; Jean-Paul Fortin, MD, MPH, MBA; Paul-Marie Bernard, MSc

Objective: To evaluate the effectiveness of a program to improve hypertension screening practices in primary care.
Design: Retrospective quasi-experimental study.
Setting: Two hospital-based family medicine centres (FMCs).
Patients: In the study FMC, two study groups of randomly selected adult patients: 425 who visited the FMC before implementation of the screening improvement program (from Apr. 1, 1983, to Mar. 31, 1984) and 418 who visited it afterward (from Apr. 1, 1986, to Mar. 31, 1987). These patients were matched with 392 and 442 control patients respectively seen during the same time frames at the second FMC.
Interventions: Educational sessions for physicians to standardize blood pressure measurement and knowledge of the recommendations from the Canadian Hypertension Society on hypertension screening and diagnosis, and specific operational incentives to improve hypertension screening, including a reference guide placed in each physician's office, a coloured form for recording blood pressure measurements placed in every patient's chart and a follow-up and recall card file.
Main outcome measure: Frequency of blood pressure measurements recorded in patient charts.
Results: The hypertension screening rate was 60% per year in the study group before program implementation and 79% in the study group afterward; the corresponding rates in the two control groups were 72% and 59% ($p < 0.0001$). Patients were more likely to be screened if they visited the physician for a periodic health examination than for other problems (e.g., psychosocial or dermatologic) and if they had a scheduled appointment rather than no appointment. Physician characteristics that were positive predictors of screening were low age, female sex and payment on a salary basis.
Conclusion: Physician education and incentives are effective in improving hypertension screening practices in hospital-based FMCs without incurring additional costs or other use of resources. Further evaluation of such a program should be undertaken in other primary care settings.

Objectif : Évaluer l'efficacité d'un programme pour améliorer le dépistage de l'hypertension artérielle en soins de première ligne.
Conception : Recherche rétrospective de type quasi-expérimental.
Contexte : Deux centres de médecine familiale (CMF) en milieu hospitalier.
Patients : Dans le milieu cible, deux groupes composés d'échantillons de patients adultes sélectionnés au hasard : 425 parmi la clientèle suivie dans le CMF avant l'implantation du

Dr. Aubin and Mrs. Vézina are in the Unité de Médecine familiale, Hôpital Laval, Sainte-Foy, Que.; Dr. Fortin and Mr. Bernard are in the Département de Médecine sociale et préventive, Université Laval, Quebec, Que.

Correspondence to: Dr. Michèle Aubin, Unité de Médecine familiale, Hôpital Laval, 2725, ch. Sainte-Foy, Sainte-Foy, QC G1V 4G5

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programme (entre le 1er avr. 1983 et le 31 mars 1984) et 418 après (entre le 1er avr. 1986 et le 31 mars 1987). Ces patients ont été appariés à deux groupes témoins de 392 et 442 patients, respectivement, suivis au cours des mêmes périodes dans l'autre CMF.

Interventions : Des séances de formation des médecins en vue de standardiser leur technique de mesure de la tension artérielle et leurs connaissances des recommandations de la Société canadienne d'hypertension artérielle en regard du dépistage et du diagnostic de l'hypertension, ainsi que des mesures incitatives précises afin d'améliorer le dépistage de l'hypertension, y compris un guide de référence placé dans le bureau de chaque médecin, un formulaire coloré pour noter les mesures de tension artérielle placé dans le dossier de chaque patient, et un fichier de suivi et de rappel.

Principale mesure de résultats : Fréquence de prise de tension artérielle notée au dossier.

Résultats : La fréquence de dépistage de l'hypertension artérielle était de 60 % par année dans le groupe cible avant l'implantation du programme et de 79 % après; les taux correspondants dans les groupes témoins étaient de 72 % et 59 % ($p < 0,0001$). Le dépistage a été effectué plus fréquemment chez les patients s'étant présentés pour un bilan de santé périodique que pour d'autres problèmes (p. ex., dermatologiques ou psycho-sociaux) et chez ceux ayant un rendez-vous que ceux qui n'en avaient pas. Chez les médecins, les caractéristiques ayant une valeur prédictive positive étaient le jeune âge, le sexe féminin et la rémunération à salaire.

Conclusion : L'éducation des médecins et l'application de mesures incitatives sont des moyens efficaces pour améliorer la pratique du dépistage de l'hypertension artérielle dans des CMF en milieu hospitalier, sans coûts additionnels ni ressources supplémentaires. Il y aurait lieu de procéder à une évaluation plus poussée d'un tel programme dans d'autres milieux de soins de première ligne.

Because of its high incidence[1,2] and its effects on the cardiovascular system[3–5] hypertension directly affects the quality of health in the general population and the need for health services. Consequently, the prevention of hypertension has become a priority for both provincial and federal governments.[6–8]

Despite recommendations for systematic screening during physician visits[9–11] a survey of the literature shows that during a 5-year period the proportion of patients whose blood pressure was measured by their physician varied widely, from 20% to 80%.[12–16] These results confirm that perceptions of and behaviour concerning hypertension screening and management differ from physician to physician.[17,18] Also, the National Blood Pressure Survey showed that there are notable regional disparities in hypertension screening.[7] Specifically, patients with hypertension in Quebec were more likely to be unaware of their condition than such patients in all other provinces, possibly because of lower levels of screening in Quebec. Medical facilities have implemented various initiatives to improve hypertension screening and management by family physicians;[19–21] however, these programs cannot be expanded to other practice settings because of the additional costs and resources entailed or because they were designed for the workplace.

On the basis of the Canadian Hypertension Society recommendations[11] a teaching physician, a nurse and senior residents in family medicine developed a secondary prevention program aimed at physicians to improve hypertension screening and management and implemented it in a hospital-based family medicine centre. We wished to test its effectiveness and benefits before recommending its implementation on a broader scale.

An earlier local study had shown an increase of 17% in the hypertension screening rate after the program was implemented.[22] Despite these favourable preliminary results, the actual contribution of the program was difficult to ascertain without a control group, for several reasons. In recent years cardiovascular disease and its prevention have been frequent topics in the medical literature; this trend may have influenced physician practice toward better hypertension screening habits. Concurrently, more young, salary-based practitioners have been recruited into family medicine centres. Because the initial evaluation of the program identified lower physician age and payment by salary as positive predictors of a preventive approach, it was important to assess the possible effects of these variables on screening practices.

Through a quasi-experimental study we evaluated the effectiveness of a secondary prevention program to improve hypertension screening in a family practice setting.

Methods

A prevention program was developed based on the Canadian Hypertension Society recommendations[11] and implemented in September 1985 at an FMC in Sainte-Foy, Que. The program provided physicians with a combination of education and operational incentives. Repeated training sessions were conducted on the expert recommendations on hypertension screening and diagnosis for practitioners and new residents. The main aim of these sessions was to standardize physician knowledge and to improve the validity of blood pressure measurement with the use of a mercury column sphygmomanometer. Operational incentives to increase hypertension screening included a handy reference

guide, placed in each physician's office, that summarized the expert recommendations for hypertension diagnosis and treatment. In addition, a form for recording pertinent data (e.g., date and blood pressure) was printed on coloured paper (to make it easy to find) and placed in each patient's chart. A follow-up card file and recall system were set up to track patients with an abnormal blood pressure who did not show up for their follow-up appointments. The number and timing of subsequent appointments were based on the expert recommendations and the recorded blood pressures. A nurse from the FMC contacted patients by telephone twice to remind them to return to the centre to have the physician measure their blood pressure again. After two unsuccessful attempts to make the patients comply with the hypertension confirmation procedure, the attending physician was notified to contact these patients directly. Through the use of this protocol about 95% of the patients with an abnormal blood pressure would be reached to return to the centre. To reinforce positively the practitioners' screening habits we distributed written feedback on their screening performance 3 years after the program was implemented.

A 1-year interval between hypertension screenings was used, which is shorter than the 2-year schedule recommended by the Canadian Hypertension Society. We decided on the shorter period because physicians in the centre use each patient's hospital chart, in which other physicians (e.g., specialists) record their observations. The chart can become quite voluminous, and thus it may be difficult to locate the last blood pressure recording, especially if the physician forgot to use the coloured form. We thought that participating physicians would find it easier to screen their patients more frequently rather than search through 2 years' worth of observations.

We conducted a retrospective experimental study to compare and analyse hypertension screening by physicians in two hospital-based FMCs and, specifically, the effect of the program on screening practices. Screening was assessed before (from Apr. 1, 1983, to Mar. 31, 1984 [T_0]) and after (from Apr. 1, 1986, to Mar. 31, 1987 [T_1]) the program was implemented. During T_0 six physicians who worked in the FMC where the prevention program was introduced constituted the study group, and seven practitioners who worked in the second FMC formed the control group. Both FMCs recruited new physicians after T_0 and before T_1; therefore, during T_1, the study group comprised nine practitioners and the control group 12.

We used patient charts from each site to study the screening practices of physicians. Using a computer-generated list we randomly selected 425 patients from the 3651 patients who visited the study group during T_0 and 418 patients from the 4811 who visited the study group during T_1. Similarly, a sample of 392 patients, matched for age, sex and type of visit, was selected from patients seen by physicians in the control group during T_0 and a sample of 442 matched patients from those seen by the control group during T_1. All patients included in the study were at least 16 years of age.

Patient data were recorded on a pretested form by the principal investigator (M.A.) and a trained research assistant (L.V.). The interobserver reliability was found to be very good after a comparison of 25 forms completed separately by each observer. A brief questionnaire was used to obtain physician data.

In the analysis the dependent variable was hypertension screening performed by physicians. For the purpose of this study screening was defined as one or more blood pressure measurements during the study period (T_0 or T_1) or in the preceding year, as recorded in the chart or on the screening form. This definition was based on the 1-year screening period recommended in the program. The independent variables were the study period (T_0 and T_1), the patient group (study and control), patient characteristics (age, sex, reason for visit, number of visits and type of visit [i.e., with or without appointment]) and physician characteristics (age, sex, number of years in practice and mode of payment). Outcomes for the variable "reason for visit" were classified according to the 17 categories of the International Classification of Primary Care.[23] We grouped these classifications into six broader categories, including one of general symptoms, against which the others were compared. The effect of the hypertension prevention program was analysed through a comparison of the "period" and "group" variables.

The sample size of approximately 400 patients was chosen to provide 95% power to detect a difference of 10% or greater in the screening rates between the two study periods, with an α level of 0.05. This 10% difference represents the "improvement threshold" for assessing the effectiveness of the program. In the preliminary evaluation[22] the practices of residents and teaching physicians were assessed, but in this study we considered only those of teaching physicians.

The χ^2 statistic and Student's *t*-test were used to compare patient and physician characteristics and screening rates in the study group samples. We used logistic regression analysis to control for the effects of independent patient and physician variables. Each variable was included in the regression model with the use of the stepwise procedure. A p value of 0.05 or less was considered statistically significant, and the variable in question was retained. Some variables were retained even if not statistically significant if they had a confounding effect on the "program effect" variable. Odds ratios (ORs) and 95% confidence intervals were calculated from regression coefficients and standard errors of the estimate. Analysis did not reveal any significant interaction effects between the "period" variable and any other variable. All analyses were performed with the use of PC SAS software (SAS Inst Inc., Cary, NC).

In addition to the main study an informal follow-up study of screening patterns at the study site was conducted 3 years later. The charts of 424 nonrandomly selected patients were reviewed for frequency of blood pressure measurements recorded.

Results

The patient characteristics did not differ significantly between the study and control groups for each period except for the number of visits, which was higher in the control groups ($p < 0.0001$) (Table 1). The physician characteristics were comparable between the study and control groups for each period (Table 2). However, they differed slightly between T_0 and T_1. During T_1, there were more young female physicians and more salaried practitioners at both FMCs. These differences were not statistically significant because of the small samples.

The 1-year hypertension screening rate rose from 60% during T_0 to 79% during T_1 in the study group and fell from 72% during T_0 to 59% during T_1 in the control group ($p < 0.0001$) (Table 3). Logistic regression analysis confirmed the positive effect of the program on screening rates (OR = 3.2) (Table 4). This OR compared the effect found in the study group during T_1 with that observed in the control group during T_0. In a comparison of screening in the control group between T_1 and T_0 the data showed a net negative effect on the screening

Table 1: Patient characteristics before (T_0) and after (T_1) implementation of a hypertension screening program

	Group; % of patients			
	T_0		T_1	
Characteristic	Study (n = 425)	Control (n = 392)	Study (n = 418)	Control (n = 442)
Sex				
Female	60.2	66.6	65.1	64.9
Male	39.8	33.4	34.9	35.1
Type of visit				
With appointment	90.8	90.3	90.7	91.2
Without appointment	9.2	9.7	9.3	8.8
Age, yr				
< 25	19.6	20.5	15.6	15.3
25–34	18.4	18.4	19.0	17.5
35–44	15.6	15.5	15.6	14.4
45–54	12.0	14.4	14.7	15.1
55–64	19.4	17.2	19.7	21.1
≥ 65	15.1	14.1	15.4	16.8
Mean no. of visits (and standard deviation [SD])	2.2 (1.8)	2.9 (2.4)*	2.3 (2.0)	3.7 (3.3)*

*$p < 0.0001$; p values were calculated with the use of the χ^2 test for proportion variables and Student's t-test for continuous variables.

Table 2: Physician characteristics during periods before and after implementation of the hypertension screening program*

	Group; % of physicians			
	T_0		T_1	
Characteristic	Study (n = 6)	Control (n = 7)	Study (n = 9)	Control (n = 12)
Sex				
Female	16.7	14.0	33.0	42.0
Male	83.3	86.0	67.0	58.0
Mode of payment				
Salary	33.3	29.0	56.0	75.0
Fee for service	66.7	71.0	44.0	25.0
Mean age (and SD)	36.2 (3.3)	36.9 (6.6)	34.8 (5.6)	37.0 (6.3)
Mean no. of years in practice (and SD)	10.2 (4.6)	10.0 (8.4)	10.0 (5.7)	11.6 (6.3)

*$p > 0.05$ for all characteristics; p values were calculated with the use of Fisher's exact test for proportion variables and Student's t-test for continuous variables.

rate (OR = 0.47). Although we observed a higher screening rate in the study group than in the control group during T_0 (OR = 1.32) this difference was not significant.

Certain patient characteristics had a direct effect on the hypertension screening rate. Visits for periodic health examinations were positively correlated with screening (OR = 2.66), whereas those for psychosocial (OR = 0.12) or dermatologic (OR = 0.28) problems were negatively correlated with screening. Scheduled consultations were a better predictor of screening than unscheduled visits (OR = 1.93). Other patient-related variables were significantly associated with screening but to a lesser degree (age [OR = 1.03] and number of visits [OR = 1.27]).

The results suggest that some physician characteristics are also predictors of hypertension screening. Salaried remuneration was more positively associated with screening than a fee-for-service plan (OR = 3.67). Physician sex and number of years in practice also influenced screening: female physicians screened patients according to recommendations more often than their male counterparts (OR = 1.63), and young practitioners had a higher screening rate than their older colleagues (OR = 1.11).

Although it was not a randomized, controlled study, it is of interest that the 3-year follow-up study involving 424 patients showed a hypertension screening rate of 82%.

Discussion

The secondary prevention program was effective in improving hypertension screening practices of physicians in a hospital-based FMC. The screening rate in the study group increased significantly after the program was implemented, whereas it decreased in the control group. Logistic regression analysis confirmed these results, even after controlling for the confounding effect of patient and physician characteristics. Differences between characteristics of the study group and those of the control group do not account for the improved screening performance in the study group. For example, the higher number of patient visits in the control group for both periods should have resulted in a higher screening rate because the regression model indicated a positive correlation between the number of visits and screening rates.

Similarly, the improvement in hypertension screening performance cannot be explained by the time lapse between the two study periods, since the logistic regres-

Table 3: Hypertension screening rates in study and control groups before and after implementation of the hypertension screening program

	Group; screening rate, %			
Period	Study (n = 425)	Control (n = 392)	χ^2 value	p value
T_0	59.8	71.9	13.4	< 0.001
T_1	78.7	59.1	38.5	< 0.0001

Table 4: Predictors of hypertension screening*

Variable (and standard of comparison for odds ratio estimates)	Odds ratio (and 95% confidence limits)
Study period (control group T_1 to T_0)	0.47 (0.33, 0.69)
Patient group (study group to control group during T_1)	1.32 (0.90, 1.96)
Effect of program (study group during T_1 to control group during T_0)	3.20 (1.72, 15.41)
Patient age	1.03 (1.02, 1.04)
Type of visit (with appointment to without appointment)	1.93 (1.28, 2.92)
No. of visits	1.27 (1.20, 1.35)
Reason for visit (each category to general symptoms category)	
Periodic health examination	2.66 (1.57, 4.53)
Psychosocial problem	0.12 (0.06, 0.24)
Cardiac or pulmonary problem	1.31 (0.76, 2.27)
Digestive, genital or urinary tract problem	0.49 (0.29, 0.84)
Other (e.g., dermatologic, ear, nose or throat problem)	0.28 (0.17, 0.46)
Physician mode of payment (salary to fee for service)	3.67 (2.39, 5.64)
No. of physician years in practice	1.11 (1.06, 1.15)
Physician sex (female to male)	1.63 (1.13, 2.36)

*Factors were analysed with the use of logistic regression analysis: likelihood ratio (deviance) χ^2 = 1500.72 (1573 degrees of freedom), p = 0.9.

sion analysis showed a negative association between the later study period and hypertension screening. The hypothesis that physicians had improved their practices to prevent cardiovascular disease because of recent medical literature was proven to be incorrect. The screening rate in the control group was significantly lower during T_1 than during T_0. This drop may have been because of a medical audit of hypertension practices during T_0 at the control FMC, the result being a transiently higher screening rate. This explanation, if true, reinforces the need for continuing long-term incentives to maintain high screening rates.

This study had certain limitations because of its retrospective design. Data from medical charts could result in an underestimation of screening rates if blood pressure measurements were not recorded. Since there is no reason to believe that this source of estimation error would differ between the study and control groups, it should not have affected the comparison of the groups' screening rates.

The positive effect of the program is corroborated by Bass, McWhinney and Donner,[20] who reported that physicians could improve hypertension screening of their patients with the introduction of a reminder system and other incentive measures. Their experiment, however, used additional medical assistants to conduct the screening, in contrast with this program, which used existing resources and thus obviated the extra costs of additional staff. This program also differed from that of Bass and associates in that an educational component was added to the incentive package. We could not differentiate the effectiveness of each of these strategies because they were used in combination.

Our study showed that some of the patient characteristics, particularly the reason for the patient's visit, were associated with higher hypertension screening rates. These results are similar to those of Cypress,[24] who found that blood pressure was measured more often during consultations for cardiovascular disease than during visits for dermatologic or musculoskeletal problems. Another screening predictor in our study was the type of visit, with a higher rate for scheduled appointments. These findings are consistent with Battista and Spitzer's cancer screening results,[25] which showed that physicians applied preventive measures mainly during scheduled periodic examinations and less frequently during unplanned or emergency visits.

Certain physician characteristics were positive predictors of hypertension screening in our study, specifically low age, female sex and payment on a salary basis. However, these findings should be interpreted cautiously because of the small number of physicians studied. Also, our study methods give an overall rather than an individual assessment of physicians' screening practices. Nevertheless, the effect on prevention practice of number of years in practice and mode of payment were generally consistent with that found in other studies.[25–27] Unlike in our study Borgiel[28] and Maheux and colleagues[29] did not find that the sex of the physician was a significant predictor of prevention practice.

The long-term effectiveness of the program is an important issue. Initial enthusiasm for a new program often subsides (as reflected by the decrease in screening rates in the control group after the audit of hypertension prevention practices). However, the screening rate of 82% found in the small, nonrandomized sample of patients visiting the study group's FMC 3 years later suggests that the program continued to be effective. However, this datum should be regarded as preliminary and inconclusive.

Conclusions

Education and incentive programs such as ours can succeed in improving physician screening practices in a hospital-based FMC. Moreover, such a program uses existing resources rather than elaborate or costly new procedures. However, we assessed this program in a hospital-based setting, which may differ from other family practices, and we assessed too small a number of physicians to generalize about the practices of all family physicians. Further evaluation of such a prevention tool should be undertaken with family physicians in other settings before the program can be implemented on a broader scale.

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Conferences
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Apr. 20–23, 1994: National Methadone Conference: Changing Lives — Healthy Communities (sponsored by the American Methadone Treatment Association, Inc.)
Washington
Aras Vasaitis, Center for Drug Treatment and Research, Koba Associates, Inc., Ste. 200, 1156–15th St. NW, Washington, DC 20005; tel (202) 328-5752

Apr. 21–24, 1994: Women's Health: Key Research and Health Care Issues — a National Multidisciplinary Conference
Hamilton, Ont.
Keynote address: Dr. Judith Kazimerski
Child care available during the conference.
I. Ellis, conference coordinator, Faculty of Health Sciences, Room 1M10, McMaster University, 1200 Main St. W, Hamilton, ON L8N 3Z5; tel (416) 525-9140, ext. 2182, fax (416) 521-2100

Le 24 avr. 1994 : Association des facultés de médecine du Canada 6e conférence sur la main-d'oeuvre médicale canadienne
Vancouver
Eva Ryten, l'Association des facultés de médecine du Canada, 1006–151, rue Slater, Ottawa, ON K1P 5N1; fax (613) 594-3364

Apr. 24, 1994: Association of Canadian Medical Colleges 6th Conference on Physician Manpower
Vancouver
Eva Ryten, Association of Canadian Medical Colleges, 1006–151 Slater St., Ottawa, ON K1P 5N1; fax (613) 594-3364

Apr. 25–26, 1994: Canadian Pharmacoepidemiology Forum
Toronto
Dr. C. Ineke Neutel, Health Protection Branch, Health Canada, 3rd floor E, Sir F.G. Banting Research Centre, Tunney's Pasture, Ottawa, ON K1A 0L2; tel (613) 954-6745, fax (613) 966-8774

Les 26 et 27 avr. 1994 : Immunologie et leucémies — Symposium international
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Apr. 26–27, 1994: Immunology and Leukemia — International Symposium
Nancy, France
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