Does a Mailed Continuing Education Program Improve Physician Performance?

Results of a Randomized Trial in Antihypertensive Care

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• **Evidence is sparse concerning the value of the "educational" materials that physicians receive in the mail. We conducted a randomized trial of a mailed continuing education program on hypertension for primary care physicians. Although formal pretesting documented that the program led to significant improvements in physician knowledge over the short term, the current study showed no lasting effect on physician knowledge (mean scores on an end-of-study questionnaire were 50% and 52% for study and control physicians, respectively) and no influence on performance in lowering the blood pressures of patients referred from screening (mean blood pressure drop for study patients, 12.2/10.4 mm Hg vs 13.0/10.6 mm Hg for control patients). The chance that we missed a difference in diastolic blood pressure as great as 3 mm Hg is less than 5%. Resources spent on instructional materials mailed to physicians may be wasted.**

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MEDICAL practitioners are hard pressed to keep pace with advances in health care knowledge, even those directly relevant to their own patients.[1]

Previous work by our group documented important deficiencies in the care of hypertensive patients, including decreased likelihood of treatment by older physicians of patients with high blood pressure[2]; frequent prescription of less therapy than was required to keep patients' blood pressure under control[3]; and a very strong negative correlation ($-.55$, $P<.001$) between the time since a physician's graduation and his or her knowledge of hypertension.[4]

Studies of continuing medical education have shown that the method most preferred by physicians is reading.[5,6] Unfortunately, there is little evidence of the effect of reading materials on competency and performance, and what evidence there is is in conflict. An Australian trial demonstrated reductions in the prescribing of drugs such as barbiturates and combination antidiarrheal-antibiotic medications by physicians who were mailed simple drug information cards.[7] However, an American trial of mailed "antiadvertising" failed to find an effect on prescribing of such drugs as propoxyphene and peripheral and cerebral vasodilators.[8]

Stimulated by the positive Australian trial,[7] we designed a mailed continuing education program for primary care practitioners concerning the management of hypertension. This program was formally pretested and found both to be highly acceptable to the physicians who received it (unsolicited) and to improve their knowledge, eradicating the negative correlation between time since graduation and knowledge.[4] We therefore designed and executed an experiment testing this program with the control of hypertension as the prime outcome of interest.

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METHODS

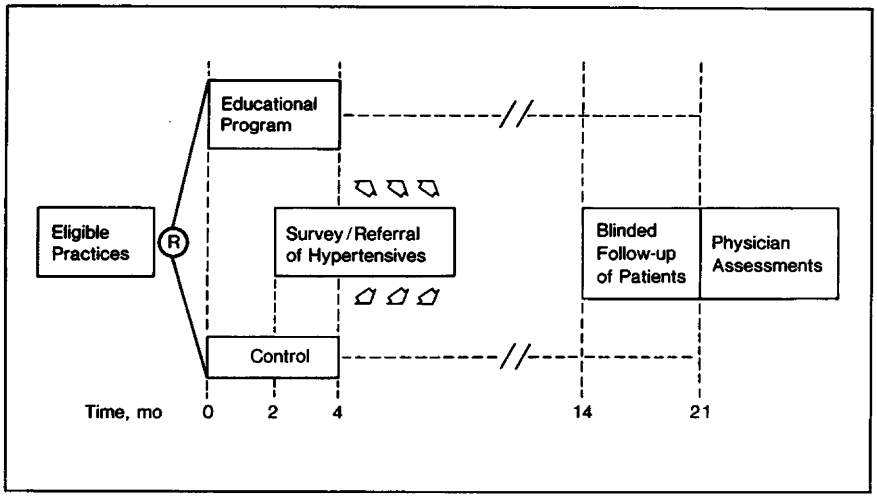
The study was conducted in two parts: a population blood pressure survey and a randomized trial (Figure). It took place in two noncontiguous, urban, Canadian communities of similar size (with 1981 census populations of 71,207 and 74,315), population distribution (42% and 43% aged 30 to 69 years, respectively), and distance (30 to 40 km) from our medical school. Neither community has a medical school.

Hypertensive patients were recruited through a household survey of homes selected by random process such that each eligible adult in the two communities had an equal probability of being selected. Patients were eligible for the study if they met the following criteria: (1) age of 30 to 69 years; (2) either receiving antihypertensive medications and having a minimum of three diastolic blood pressure readings at one home visit of 90 mm Hg or greater, or not receiving antihypertensive medications and having minimum diastolic blood pressure readings on three home visits of 90 mm Hg or greater; (3) expecting to reside in the community for the next 12 months; (4) having a personal physician within the study communities; and (5) consenting to participation in the study after a description of its nature and procedures. Eligible patients were asked to visit the physician of their choice for further assessment and follow-up of their elevated blood pressure. For each referred patient, the physician received a letter describing the survey and listing the patient's blood pressures.

All primary care physicians and internists in the two communities were included in the study with the exclusion of those who were not named by an eligible patient as their source of primary and/or hypertensive medical care. Physician consent was not requested.

To reduce the possibility of "contamination" (with members of the control group receiving part or all of the intervention), physician practice groups were the units of randomization. Within each city, physicians were stratified according to solo or group practice, then randomly allocated within these strata to the study or control group, keeping practice groups together.

The intervention has been described in detail elsewhere.[4] Briefly, physicians assigned to the study group received 14 weekly installments of practice-oriented information, designed to be read in three to five minutes each, on the diagnosis, workup, therapy, and follow-up of hypertensive patients, particularly emphasizing the problems of inadequate medication prescriptions and low patient compliance. Practical, behaviorally oriented strategies for overcoming these problems were outlined. In addition to didactic materials, the



Study design. R indicates random allocation.

package contained office aids, including workup and management charts, chart stickers to increase the visibility of hypertension surveillance and the success of antihypertensive care, and a follow-up appointment system to encourage detection and recall of patients who missed clinic appointments.

As illustrated in the Figure, the initial installments of the educational program were sent in advance of the referral of the first patients from the community survey so that physicians would have the initial installments of the program on hand before the first patients were referred. To reduce the likelihood of physicians perceiving that they were under special scrutiny, the survey was introduced to physicians by separate mailing as an independent project and patients were not informed of the continuing medical education aspects of the project. To reduce contamination, physicians receiving the educational program were told that the program was undergoing a field trial and were asked not to share it with their colleagues.

Patients were visited in their homes at the beginning and end of the one-year study period by staff who were "blind" to the study group to which the patient's physician belonged.

Blood pressures were measured by standard mercury sphygmomanometers on initial screening visits and Hawksley's random-zero mercury sphygmomanometers[9] thereafter. A blood pressure was taken at the beginning of the visit to familiarize the subject with the procedure, and at the end of the interview, after at least five minutes' rest, three readings (each separated by at least 30 s) were taken with the subject in the sitting position. First- and fifth-phase Korotkoff's sounds were used for systolic and diastolic pressure, respectively. Decisions concerning eligibility were based on minimum diastolic readings, as these have been shown to be more reliably determined in the field and to be equivalent to averaged readings for estimation of blood pressure class.[10] Patients already receiving blood pressure medications at the first visit received only one visit. Subjects not receiving medications were visited on up to three occasions if their blood pressure remained elevated.

At the end of the study, after a telephone call on the intended day of the visit, patients were visited on only one occasion; it was felt that the visit could affect subsequent medication compliance, altering the validity of further follow-up assessments. A questionnaire was administered and medication compliance was assessed by pill counts, using a method employed in a previous study.[11]

Physicians were assessed only at the end of the study, following all patient home assessments. The charts of consenting patients were reviewed for all but seven practices, in which physicians objected on grounds of patient confidentiality. In two of these practices (involving six physicians and 11 participating patients), the chart review was conducted by the physicians' own staff, according to our directions. Physicians were also asked to complete a self-administered questionnaire concerning their educational background, clinical experience, usual methods of caring for hypertensive patients, and knowledge of current methods of antihypertensive care (assessed by multiple-choice questions and based on expert recommendations).[4,12,13]

The study was designed to detect an absolute increase of 20% in the proportion of patients with controlled blood pressure in the study group, compared with the control group, at the end of the study, with a risk of a type I ("alpha") error of 5% and a type II ("beta") error of 10%, based on a fixed sample size of 104 patients in each group.

For the main study end points of blood pressure and medication compliance, comparisons between the study and control groups were based on means that were accumulated within the units of randomization—physician practice groups—then averaged across the practice groups using Student's two-tailed, unpaired t test for statistical analysis and the number of practice units to determine degrees of freedom. For other analyses, practice groupings were ignored: this simplification has a negligible effect on the results of the analyses as the number of patients per physician group was small. Proportions were compared using Yates' corrected χ^2 statistic. P values less than .05 were taken as indicating statistical significance.

RESULTS

Patients named 76 physicians in 62 practices as the source of their primary and/or hypertensive care and 41 (54%) of these physicians in 33 practices (53%) were randomly allocated to the study group. No physician refused to allow his or her patients to be followed. The study and control group physicians were well matched, with no statistically significant differences on baseline characteristics, including years since graduation, graduation from Canadian or foreign medical schools, postgraduate training, number of physicians per practice, and number of participating patients per physician.

A total of 5,823 households were included in the population survey and interviews were obtained in 5,567 (95%). Of 6,705 age-eligible adults in responding households, 427 (6%) refused home blood pressure assessment and 20 home assessments (0.3%) were otherwise incomplete. Of the 6,258 fully assessed subjects, 209 met the blood pressure criteria for the study and 198 (3%) met all study criteria for eligibility. Based on the number of age-eligible subjects in consenting households (1.20) and extrapolating this figure to refusing households, the estimated overall response rate was 89%.

Of 107 eligible patients who were referred to study group physicians, five (4.7%) were lost to follow-up while ten (11%) of 91 control patients were lost. Reasons for loss to follow-up include moving from the region (five), death (one), and refusal at the time of follow-up (nine). The patients who completed the study were comparable on key baseline features, including age, gender, education, em-

Table 1.—Measures of the Process of Care During the Study

	Study (N=102)	Control (N=81)	P Value, Study vs Control
Mean ± SD visits to physician	6.9 ± 7.0	6.9 ± 6.3	NS
No. (%) of patients with blood pressure check	97.0 (95.0)	70.0 (86.0)	NS
No. (%) told blood pressure elevated	88.0 (86.0)	68.0 (84.0)	NS
No. (%) of patients on blood pressure medication	77.0 (76.0)	64.0 (79.0)	NS
Mean No. ± SD of medications	1.2 ± 0.85	1.1 ± 0.74	NS
Mean No. ± SD of tablets/day prescribed	1.1 ± 0.99	1.3 ± 1.0	NS
Mean % ± SD compliance rate*	78.0 ± 30.0	76.0 ± 28.0	NS

*Data incomplete for nine study and four control patients.

Table 2.—Blood Pressure Changes From Entry to One-Year Follow-Up*

	Practices		
	Study (N=33)	Control (N=29)	P Value, Study vs Control
Mean (± SD) systolic pressure, mm Hg			
Baseline	152.9 ± 17.8	155.2 ± 22.4	NS
Follow-up	140.7 ± 11.3	142.2 ± 21.0	NS
Decrease	12.2 ± 15.1	13.0 ± 15.9	NS
Mean (± SD) diastolic pressure, mm Hg			
Baseline	98.0 ± 3.8	99.0 ± 9.2	NS
Follow-up	87.6 ± 5.5	88.3 ± 11.2	NS
Decrease	10.4 ± 6.5	10.6 ± 7.9	NS
No. (%) of patients with mean diastolic blood pressure <90 mm Hg	63 (61.8)	45 (55.6)	NS

*Data aggregated within physician practices; P levels take into account clustering.

Table 3.—Control of Hypertension at One Year by Three Standards

Standard*	Study Patients, No. (%)	Control Patients, No. (%)	P Value, Study vs Control
Mean DBP <90 mm Hg	63 (61.8)	45 (55.6)	NS
Minimum DBP <90 mm Hg	68 (66.7)	54 (66.7)	NS
HDFP criteria†	60 (58.8)	44 (54.3)	NS

*DBP indicates diastolic blood pressure; HDFP, Hypertension Detection and Follow-up Program.
†DBP <90 mm Hg if admission DBP ≥100 mm Hg or receiving medication at entry; decrease in DBP ≥10 mm Hg for those entering with DBP 90 to 99 mm Hg.[21]

ployment, previous knowledge of hypertension, and previous and current antihypertensive therapy. The mean blood pressures for the study and control patients were 152/98 mm Hg and 152/99 mm Hg, respectively. There were also no statistically significant differences in comparing baseline features of patients who did and did not complete the study. The following results are based on physicians and patients available for follow-up.

As shown in Table 1, a slightly higher proportion of study group patients reported having a blood pressure check at their physician's office following referral ($P>.05$) but there were no differences in other process variables.

The lack of differences between groups does not mean absence of therapeutic activity; the proportion of patients prescribed blood pressure medications rose from 57% to 76% in the study group and from 54% to 79% in the control group ($P<.01$, overall).

Blood pressures improved considerably in both study groups over the course of the trial (Tables 2 and 3). However, no differences between the study and control groups were observed for the changes in systolic or diastolic blood pressure. Neither were there any significant differences in the percentages of patients whose diastolic blood pressures were controlled at the end of the study by the three definitions provided in Table 3.

The chance that these results conceal a clinically important difference between the groups is small. The 90% confidence limits around the diastolic blood pressure difference of −0.2 mm Hg (in favor of the control group) extends from −3.21 to 2.81, indicating a chance of less than 5% of missing a difference as large as 3 mm Hg in favor of the intervention.

Finally, physicians were asked to complete a multiple-choice questionnaire of their knowledge of hypertension at the end of the study. Seventy-eight percent of study physicians and 91% of controls did so ($P>.05$). The mean knowledge scores were no different for the two groups (50% and 52% for study and control groups, respectively; $P>.05$).

A statistically significant negative correlation ($P<.001$) was observed between knowledge scores and time since graduation within both groups, though this correlation was slightly less strong for the study group physicians (−.32) than for control physicians (−.63). However, no significant correlations were observed between time since graduation and systolic or diastolic blood pressures or patient compliance with medications. Similarly, there was no significant correlation between knowledge scores and systolic or diastolic blood pressure for either group, but knowledge scores in the study group only were weakly correlated with patient compliance ($r=.25$, $P<.05$).

COMMENT

Our study demonstrates no influence of a mailed continuing medical education program on the practices of physicians or on the control of blood pressure of hypertensive patients referred from a community survey to these physicians after the program was begun. The study numbers were large enough to accept this negative result with a high level of confidence. Because patients were selected to be representative of the communities in which they lived and because all of the physicians these patients named as the source of their primary and/or hypertensive care were included in the study, we believe that the results are generalizable at least to similar medical care settings.

In attempting to understand these results we have considered several possible explanations. First, the educational program may have been ineffectual in transmitting knowledge. This explanation is possible but unlikely, as we have demonstrated in a formal pretest a significant increase in physician knowledge at the end of the educational program.[4]

A second possible explanation is that the educational program does

transmit information, but this is soon forgotten, without incorporation of the information into practice. This appears to be at least one of the explanations for our findings. The end-of-study knowledge scores from our pretest study[4] were gathered about one month after the last installment of the program, but in the current investigation there was a delay of more than 17 months. The correlation between time since graduation and scores was virtually identical at the beginning of the pretest study and the end of the current study ($r=-.54$ and $r=-.48$, respectively). Furthermore, test scores were just slightly lower at the beginning of the pretest study than at the end of this investigation (47% and 52%, respectively). However, the test scores for the latter were far lower than the final scores for the intervention group for the pretest study (52% vs 66%, respectively). These results would also appear to rule out the possibility of "contamination," with the control group receiving the information in the educational program by one means or another, as an explanation for the negative findings: both groups scored at a similar level to physicians who had not had the program in the first study.

It might also be considered that the educational program had no effect because physicians in both groups performed as well as current medications and methods of achieving high patient compliance permit. In fact, the community survey at the beginning of the study showed a high level of treatment for hypertensive individuals (87% on prescribed therapy) and of blood pressure control (70% of all hypertensives had diastolic blood pressures lower than 90 mm Hg).[14] Furthermore, judging from patients' blood pressures at the end of the study, one very positive finding was how much more physicians accomplished than in our previous studies in the same region. Using similar criteria and measurement techniques in a study completed in 1974, only 35% of patients with initially uncontrolled hypertension had controlled blood pressure (mean diastolic blood pressure lower than 90 mm Hg) one year after referral to their family physician.[15] In the current study, 59% of the patients had controlled blood pressure one year after referral. In addition, this improvement in performance compares favorably with the success achieved by special hypertension clinics in the Hypertension Detection and Follow-up Program.[16] Applying the slightly more rigorous Hypertension Detection and Follow-up Program criteria for blood pressure control (Table 3), 57% of the patients in our study achieved good blood pressure control at one year, compared with 52% of the Hypertension Detection and Follow-up Program "stepped-care" patients and only 29% of patients who were referred to physicians in the community. Thus, although there does appear to be room for further improvement in the performance of the physicians in our study, the margin for improvement is much less than in the past.

It may also be that referring an untreated or undertreated patient to a physician provides a greater stimulus to perform well than did the educational program. In other words, the effect of the educational program may have been overwhelmed by the manner in which patients were recruited and referred to physicians in the study. However, this hypothesis begs the question of why physicians did so much better in the current study than in our previous investigations in the region, employing similar referral procedures.

Our findings are at odds with those of a study in Australia in which prescribing of medications appeared to be influenced by simple, mailed drug information cards.[7] However, that study was not a randomized trial and did not provide a direct connection between the mailing of the information cards and changes in specific physicians' prescribing habits. Rather, our results agree with those of a randomized trial of "antiadvertising" (the mailing of professionally prepared mailed advertisements aimed at reducing the frequency of prescription of inefficacious medications).[8] In addition to confirming the negative conclusion of this investigation on the process of prescribing, our findings go one step further: patient outcomes were not affected.

Large volumes of printed materials are mailed to physicians for "educational" purposes, from both commercial and noncommercial sources. In the case of hypertension at least, it appears from our study that the resources utilized to prepare and post these materials may well be wasted and should perhaps be diverted into more effective forms of continuing education[17] and/or into further development of and research into mailed continuing education offerings.

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