A Community-Oriented Primary Care Project in a Rural Population: Reducing Cardiovascular Risk

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A controlled community-oriented primary care (COPC) program designed to reduce cardiovascular risk was conducted in two towns in a poor, rural area of New York State that have populations with high levels of cardiovascular mortality. In both towns, house-to-house visits were used to screen for blood pressure, gather information about cardiovascular risk knowledge and behavior, and provide a cardiovascular educational program. Persons with elevated blood pressure were advised to seek follow-up. Additional interventions, carried out in the study town only, included ongoing follow-up for those with elevated blood pressure and their providers, and sliding-fee medical services for those with financial barriers to care. At rescreening 2 years later, residents of the study population had an adjusted systolic blood pressure 3.1 mm Hg lower than those in the control population (95% confidence interval [CI] = 0.9, 5.3). Furthermore, those who were screened at both rounds had an adjusted systolic blood pressure 2.7 mm Hg lower than those who had not previously been screened (95% CI = 0.6, 4.8). Although knowledge of cardiovascular risk factors increased among those who were surveyed in both rounds, there was little demonstrable effect on cardiovascular risk behaviors. Difficulties were encountered in engaging the participation of all medical providers, and less use was made of the sliding-scale program than expected. While it appears feasible to implement the technical methodology of a COPC model in a rural setting, it is crucial to engage the support of the local and medical community. **J Fam Pract 1990; 30:639-644.**

The merits and practicality of implementing community-oriented primary care (COPC) in the United States have been debated in the recent literature.[1–6] There have been, however, few American studies reported that explicitly use the principles of COPC in their design.

Components of COPC as described in an Institute of Medicine report[5] include the provision of primary care services to a defined population and the direction of systematic efforts toward identifying and addressing the major health problems of that community through effective modifications in both primary care services and other appropriate community health programs. Interventions are evaluated for their effectiveness in improving the health of the community. Abramson and Kark[6] additionally invoke community participation "as a prerequisite for the satisfactory and continued functioning of a COPC service."

Many problems have been identified in adapting the tenets of COPC for implementation in the United States. Geiger,[1] writing in 1982, cited lack of regionalization of primary care, competition of health care providers for patients, health care being viewed as a commodity, lack of insurance payments (from both a provider and consumer perspective), and difficulties in defining denominators as major impediments to COPC. O'Connor,[4] in a recent critique of COPC, noted ongoing problems of economic (predominantly lack of reimbursement for COPC activities) and organizational barriers, as well as lack of physician interest in and training for COPC.

Reported here are the results of a program using elements of a COPC model[5,7,8] in a rural, community-hospital–based practice. The goal was to address the high rates of cardiovascular and cerebrovascular mortality demonstrated in the 1983 vital statistics for an economically depressed agricultural county of central New York. Based on these indicators of high crude cardiovascular

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mortality, a community survey and intervention was designed to lower cardiovascular risk.

METHODS

The COPC model was used by one of the authors (M.R.G.) in the initial efforts to define the health of the community served by her practice and to design programs that would address health needs as well as strengthen the referral base for O'Connor Hospital, the 28-bed community hospital that employs her. The medical staff of the hospital included two full-time internists, two half-time family physicians, a part-time anesthesiologist and pathologist (both with general practices), and a surgeon. The family physicians were hospital employees; the other physicians were in private practice.

The preliminary definition of the health of the community was begun using data from the New York State Department of Health for crude and adjusted mortality rates on a county basis. The county Public Health Nursing Service provided immunization status and infectious disease information. The 1983 death rates from cerebrovascular and cardiovascular illness in the county were markedly elevated compared with those for the state as a whole and the United States.

Because many of the risk factors for cardiovascular disease are known to be amenable to educational and medical interventions, it was decided that the initial community definition step of COPC could be combined with an intervention. In 1984 a survey was developed that collected standard demographic information, health care utilization information, and cardiovascular risk and behavior characteristics. The survey was piloted in the summer of 1984 by medical students from the University of Rochester. Additional expenses were supported by a $5000 grant from the O'Connor Foundation, a local philanthropic organization. The New York State Department of Health, Heart and Hypertension Institute provided subsequent funding for the 3 years of the program. Support averaged $22,000 each year and allowed part-time support of a community health worker (a registered nurse), medical students, a program coordinator, and 10% of a family physician's salary.

Two towns within the county, Meredith and Kortright, were chosen for the program because of their demographic similarity and their location within the geographic service area of O'Connor Hospital. Area physicians were introduced to the program through medical staff meetings during which the purpose of the program was explained and cooperation was requested in providing follow-up on people living in Meredith with elevated blood pressure who identified a local physician. Community health workers (medical students and a registered nurse) were trained in survey administration and blood pressure measurement before they conducted the program.

All persons over 17 years of age living in houses occupied year-round were included in the program. The community health workers contacted each household either by telephone or by leaflet. The workers explained the program and an appointment was made (telephone), or an approximate time of revisit was indicated (leaflet). Homes where all age-appropriate household members were not initially available were returned to at hours convenient for those missed. Households where no one was at home were visited up to a maximum of three times during each screening round before being discounted. Household re-identification was accomplished by enumerating households on town planning maps and verifying family names on second-round visits.

In addition to measurement of blood pressure (two readings, 5 minutes apart), the visits elicited survey information including standard demographics (age, sex, marital status, family size, occupation, household income, and education) and utilization of health care services (use of preventive services, usual source of care, frequency of visits, prior measurements and treatment of blood pressure, and insurance status for outpatient care). Questions relevant to cardiovascular health were asked, including height and weight, knowledge of cardiovascular risk factors, smoking history, alcohol intake, leisure exercise, and diet, including salt and cholesterol consumption. The number of eggs consumed per week was used as a brief indicator of cholesterol consumption, based on the widely publicized recommendations of the American Heart Association's Healthy Heart program. A short educational presentation appropriate for the household's level of information was delivered at the conclusion of the survey administration.

The towns were surveyed twice. Survey 1 was conducted during 1984 and 1985, and survey 2 was conducted in 1987. In the second survey cholesterol measurements were also made. After survey 1, persons in both towns with elevated blood pressure (mean systolic >140 mm Hg, or diastolic >90 mm Hg) were referred to their regular providers for follow-up. The following additional interventions were provided to those who lived in the town of Meredith (the study population). Ongoing contact was maintained with those with elevated blood pressure, and permission to contact their providers was requested to facilitate follow-up. Those with no provider or with financial barriers to health care were offered free rescreening with the program and sliding-fee medical care as needed. Various community sites in Meredith (eg, food distribution sites, churches, and town board meetings) were used for additional cardiovascular educational meetings.

The study had a cohort design, with the population of

Kortright acting as a control for the effects of the additional interventions on the population of Meredith. Because of the mobility of both populations, there were both "dropouts" (those who could not be recontacted in survey 2) and "new residents" (people in both towns participating in survey 2 who had received no intervention). The new residents formed an additional control group for the overall effect of the interventions.

The following three hypotheses were examined: (1) The educational program conducted during survey 1 would result in increased knowledge of cardiovascular risk factors and modification of behaviors affecting cardiovascular health in populations of both towns; (2) as a result of the increased intervention in Meredith, blood pressures in survey 2 would be lower in Meredith than in Kortright; and (3) persons participating in both surveys would have better blood pressure control, more healthful habits, and more knowledge of cardiovascular risk factors than those new residents first contacted during survey 2.

The primary outcomes of interest were the survey 2 values of mean systolic blood pressure (since the systolic value contributes most strongly to coronary heart disease mortality[9]), knowledge of cardiovascular risk factors, and prevalence of cardiovascular risk behaviors. One set of analyses (before–after) focused on those who were screened twice. The other compared the survey 2 results of those who were surveyed twice in both towns with those who participated only in survey 2 (new residents).

For the purpose of this report, the cardiovascular risk knowledge, socioeconomic characteristics, and behavioral characteristics were dichotomized. Knowledge was divided by those who could identify either two or fewer cardiovascular risk factors or three or more. Poverty was defined as family income of less than $10,000, or less than $20,000 for households with five or more members. Manual labor included semiskilled and unskilled laborers, farmhands, and truck drivers. Egg consumption was dichotomized at greater than two eggs per week. A salty diet was defined by use of a salt shaker at meals either "often" or "always." Increased alcohol consumption was defined as at least seven drinks per week. Persons performing no vigorous exercise during leisure time were characterized as having low leisure activity. Obesity was defined as a body mass index, ie, weight (kg)/height (cm^2), greater than 120% of ideal.

Differences between means were compared using Student's t tests. Differences between proportions were compared using chi-square tests or McNemar's tests for before-after comparisons.

Ordinary regression analyses were used to examine the effect on systolic blood pressure of the additional interventions in Meredith compared with Kortright while adjusting for possible confounders including cardiovascular risk factors and baseline differences in blood pressure between the populations of the two towns. To examine the effect of referral for elevated blood pressure at the first screening, one of the regression analyses included the interaction between whether a referral for high blood pressure was made and the town, Meredith or Kortright. Ordinary regression was also used to examine the effect of the overall intervention (those surveyed twice compared with new residents) on systolic blood pressure at the second screening while adjusting for confounders. Logistic regression analyses were used to adjust for possible confounding by age, sex, income, and education on the effect of the overall intervention on each of the dichotomized cardiovascular knowledge and behavior variables.

RESULTS

In the first survey, 541 (86%) of the 629 households occupied year-round were contacted. Of the 1168 individuals who were over 17 years old, 1066 (92%) had blood pressure measurements. Of the 1066 screened, 441 (41%) lived in Meredith. Two years later, 660 (61%) of persons originally screened and 366 (66%) of households were reidentified. Of the 660 rescreened, 302 (45%) lived in Meredith. In this second survey 508 of the 557 households occupied year-round were contacted. Of the 1063 people who were over the age of 17 years, 1017 (96%) had blood pressure measurements. Thus, 403 (38%) of those at the second screening were new residents.

At the first screening, mean systolic blood pressure was 124 mm Hg for the Kortright group and 128 mm Hg for the Meredith group. This difference was statistically significant ($t = 3.2$, $P = .0015$) and persisted after adjustment for the lower mean age of Kortright residents (45.9 years compared with 49 years, $t = 2.35$, $P = .019$). There were 261 (24%) people referred for elevated blood pressure, of whom 109 (42%) lived in Meredith. Of those with identified physicians in Meredith, information was received on 67 people (62%) who had returned to their physicians or to the program for follow-up. There were 26 people with elevated blood pressure and financial barriers to care in Meredith who were rescreened. Of these, nine availed themselves of the sliding-scale follow-up care.

The mean systolic blood pressure of the dropouts was 125 mm Hg, which was not statistically significantly different from those surveyed twice (126 mm Hg, $t = .7$, $P = .5$). Dropouts were younger (43.9 years compared with 47.6 years, $t = 3.2$, $P = .002$), and tended to be poorer (28% below poverty compared with 23%, $\chi^2 = 2.2$, $P = .14$). Adjusting for these possible confounders did not reveal any effect of dropout status on systolic blood pressure (95% confidence interval [CI] for effect = −1.4, 2.6 mm Hg).

TABLE 1. ADJUSTED EFFECT OF STATISTICALLY SIGNIFICANT ($P < .05$) PREDICTORS OF SYSTOLIC BLOOD PRESSURE AT SECOND SURVEY

Predictor	Parameter Estimate (mm Hg)	95% Confidence Interval
SBP 1* (per 10 mm Hg)	5.8	4.9, 6.4
Age (per 10 y)	1.7	1.0, 2.4
Obesity	4.2	2.0, 6.4
Place-Kortright	3.1	0.9, 5.3

NOTE: Parameter estimate represents the effect of predictor on systolic blood pressure at second survey, adjusted for other predictors.
**SBP 1 denotes blood pressure at first survey.*

TABLE 2. ADJUSTED EFFECT OF STATISTICALLY SIGNIFICANT ($P < .05$) PREDICTORS OF SYSTOLIC BLOOD PRESSURE AT SECOND SURVEY, COMPARING THOSE SCREENED TWICE WITH NEW RESIDENTS

Predictor	Parameter Estimate (mm Hg)	95% Confidence Interval
Age (per 10 y)	3.7	3.2, 4.3
Obesity	7.7	5.7, 9.7
New residents	2.7	0.6, 4.8
<12 years of school	3.5	1.2, 5.8
Male sex	4.5	2.5, 6.5

NOTE: Parameter estimate represents the effect of predictor on systolic blood pressure at second survey, adjusted for other predictors.
New residents are those screened only at the second survey compared with those screened twice.

At follow-up 2 years later the mean systolic blood pressure in both towns was 126 mm Hg for those surveyed twice. Among new residents mean systolic blood pressure was 125 mm Hg. New residents tended to be younger (42.2 years compared with 49.6 years, $t = 6.5$, $P < .0001$) and poorer (36% below poverty level compared with 28%, $\chi^2 = 6.7$, $P = .009$).

Table 1 summarizes the results of a regression analysis and shows the statistically significant predictors of systolic blood pressure in survey 2 for those screened twice. No other measured demographic or behavioral variables made any additional statistically significant contribution to the equation (P all $>.1$). Residence in Meredith was associated with an adjusted systolic blood pressure 3.1 mm Hg lower (95% CI = 0.9, 5.3). The interaction between the presence or absence of elevated blood pressure at baseline and town of residence made no significant ($F = 1.19$, $P = .28$) contribution to the equation. This finding suggests that the benefit accruing to those living in Meredith was not concentrated among those referred because of elevated blood pressure at baseline.

The results of the regression analysis to compare survey 2 systolic blood pressure of those screened twice with the new residents are summarized in Table 2. No other variables made significant contributions (P all $>.1$). People who had been previously screened had an adjusted systolic blood pressure that was 2.7 mm Hg lower than those who had not been previously screened (95% CI = 0.6, 4.8).

Of the 625 who responded to the cardiovascular risk factor knowledge questions on both surveys, 470 (75%) could name more than two cardiovascular risk factors at the time of the first survey. This more knowledgeable group increased to 513 (82%) on follow-up (McNemar's test, $z = 3.2$, $P < .0001$). Of the 387 new residents who responded to this question, 295 (76%) could identify more than two risk factors. They were significantly less knowledgeable (Fisher's exact test, $P = .036$) than those who were surveyed twice. This difference persisted after using logistic regression to adjust for differences in age and socioeconomic status (odds ratio = 1.21, 95% CI = 1.04, 1.42).

Egg consumption dropped over the 2-year period, from 58% eating more than two eggs per week to 47% at follow-up (McNemar's test, $z = 4.8$, $P < .0001$). Only 47% of new residents ate more than two eggs per week (χ^2, $P > .8$). Using logistic regression to adjust for differences in age and socioeconomic status did not change this result. Smoking prevalence showed little change among those surveyed twice, decreasing from 31% to 28% (McNemar's test, $z = 1$, $P = .15$). Among new residents, 23% were smokers, which was not a statistically significant difference ($\chi^2 = 3.0$, $P = .083$), and adjustment with logistic regression did not change this result.

There were no statistically significant differences between persons screened once and those screened twice in other cardiovascular behavioral risk factors, including level of leisure activity, salt consumption, alcohol consumption, or obesity.

DISCUSSION

The beneficial effects observed on blood pressure and cardiovascular risk knowledge provide some support for the utility of mounting a community-wide effort at cardiovascular risk reduction. Though the drops in blood pressure observed seem small on an individual clinical basis, from a community perspective they are potentially important. A 1-mm Hg drop in systolic blood pressure translates into a 2.25% reduction in the risk of dying.[10] Abramson and co-workers,[11] working in Jerusalem in a larger program, have reported success in the use of a COPC model for decreasing cardiovascular risk factors in the intervention community of Kiryat Hayovel.

The observation that the benefit in Meredith compared with Kortright was not concentrated among those referred for elevated blood pressure raises the question as to what aspect of the intervention should be credited for the overall improvement in systolic blood pressure. It is possible that the increased communication with physicians in Meredith, together with the community presentations, resulted in benefit accruing to all members of the community rather than just to those referred. In general, the results are congruent with findings of the MRFIT[12] and the HDFP[13] trials, in which both the usual (regular) care and the special intervention groups achieved statistically significant decreases in blood pressure, but the decreases in the intervention groups were greater.

The increase in knowledge of cardiovascular risk factors among those who participated in both survey rounds, and their greater level of information compared with those surveyed for the first time in 1987, are compatible with the experience of the Stanford Heart Disease Prevention Project,[14] in which an intensive media campaign significantly increased knowledge of cardiovascular risks, particularly in those receiving face-to-face counseling. The lack of a significant effect on behavioral risk factors suggests that people are more refractory to changes in behavior than to changes in knowledge and that the program was not effective in this regard. The short time interval of the study and the absence of an intensive ongoing educational program may have contributed to the lack of effect.

The inability of the program to engage more of the higher risk lower socioeconomic population by removing financial barriers to care was a disappointing outcome. Despite concerted efforts at telephone and mail follow-up, this segment of the population proved to be difficult to penetrate. An initial failure to involve the community adequately or to tailor the educational component appropriately to this group may explain this poor showing. This rural population, however, may have had reservations toward medical care or what they perceived as charity.

The modest interventions of this program were compromised by lack of cooperation from four of the 47 physicians who collectively cared for 38% of the Meredith residents identified with elevated blood pressure in the first year of the program. Despite efforts to inform these physicians of the disinterested goals for this program, it was greeted with deep suspicion.

The significant loss to follow-up accounted for by mobility (although compatible with US census findings[15]) and death in this population may have resulted in bias. From 1984 to 1986, 20% of the county farms closed. This high closure rate reflects a significant economic stress to the two populations, which may have also compromised the effectiveness of the interventions. The attrition by 10% of year-round occupied homes over the period of this study is due to a trend toward second-home ownership in the two towns.

The interpretation of these results needs to be tempered by some of the methodological limitations of the study design. The study was essentially a before-after design with an external control (new residents). Causal inference is limited by the possibility of unmeasured secular changes accounting for the observed effects. It is also possible that systematic errors in the way blood pressures were recorded affected the results.

It is possible for a primary care practice to implement COPC in a rural setting and achieve outcomes of measurable benefit. The mechanistic aspects of the intervention that were practice driven and controlled (eg, survey development and administration, and data analysis) were easier to accomplish. More difficult was sustaining program access to all members of the community. Early and ongoing assessment of community needs and perceptions appear to be important aspects of this process. In communities where medical care for the defined population is shared by many providers, the support of the medical community is crucial and needs to be assiduously cultivated.

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