Implementation of a Hypertension Control Program in the County of North Karelia, Finland

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HYPERTENSION IS A MAJOR PUBLIC HEALTH PROBLEM in most societies throughout the world. Even though clinical trials have demonstrated that the mortality and morbidity due to it can be reduced by intervention with antihypertensive drugs (*1–5*), until recently there have been no adequate reports of attempts to attain communitywide primary prevention of elevated blood pressure. In spite of effective and well-tolerated antihypertensive agents and increased medical knowledge and resources, epidemiologic studies consistently have shown that a large proportion of hypertensives in the community are unidentified and untreated or treated ineffectively (*6–10*). Control of hypertension still remains a major challenge in health care. Therefore several medical experts have stressed the urgent need for establishing better and more effective programs to control this disease (*6,10–14*).

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Background

A model program to control hypertension was established in North Karelia, a county in eastern Finland with an exceptionally high rate of cardiovascular diseases (*15*). Designed as a national pilot program in hypertension control, it comprised part of a comprehensive community project to reduce cardiovascular diseases and was integrated into the existing health structure of North Karelia (*8,15,16*). The pilot program consisted of systematic intervention over the 5-year period May 1, 1972–April 30, 1977, and a careful scientific evaluation. The aims of the evaluation were to assess the effects of the program on the population of North Karelia, to determine its applicability to other areas, and to estimate the program's costs, all with a view toward obtaining a comprehensive picture of the process that took place in the community as a result of the program (*16,17*).

The feasibility and effect of this hypertension program has been evaluated (*18,19*). Cost analysis is still underway, but preliminary cost data are available (*20*). In this paper, we describe the methods used to implement the intervention in North Karelia.

To understand the application of these methods and the circumstances under which the hypertension control program was implemented in North Karelia, some knowledge is needed about certain aspects of the na-

tional health care system. Early in 1972, a new public health act came into force in Finland that obliged local communities to establish health centers, which were to be responsible for the primary health care of the population at the local level. In the County of North Karelia, 12 of these centers were established. Most physicians in the county (who numbered approximately 1 per 3,500 inhabitants at the beginning of 1975) are general practitioners and work in these centers. There are few private physicians in the county. The 1972 public health act also provided that the activities of the health centers were to be planned for 5-year periods, that the national plan for health care was to be followed, and that more emphasis was to be placed on preventive aspects of major public health problems.

Since the 1940s, Finland has had a network of local public health nurses, who have received 3½ years of education in nursing and public health. They are trained both to take care of the sick and to provide health education. These nurses (there is approximately 1 per 1,200 inhabitants of Finland) are attached to the local health centers. Public health nurses have traditionally been engaged in preventive efforts such as counseling clients in clinics, workplaces, schools, and homes. Close contact with the local population has enabled them to offer individualized services in the field to individuals and families.

Another pertinent aspect of the health care system in Finland is that the costs of drugs for some chronic diseases, including hypertension, are fully reimbursed by the country's national social security institution, and thus the drugs are free to the patient.

The North Karelia Project had been established in response to a petition from the local population for national assistance to reduce the exceptionally high cardiovascular disease mortality and morbidity in the area. Introduced gradually, the project was implemented mainly through the local health centers, where physicians and nurses followed guidelines set by the project staff and worked under its supervision.

The activities of the hypertension subprogram included the training of health care personnel, establishment of an information system to teach people about hypertension, and organizing for the detection, treatment, and followup of hypertensives. A hypertension dispensary was established in each of the 12 health centers in North Karelia. At these dispensaries, the local public health nurses and physicians received continuous training, which facilitated integration of the dispensaries into the health centers' operations. A central hypertension register was set up at the beginning of the project to assemble data and to follow up all hypertensives in the county as a means of controlling their hypertension. This register and the hypertension dispensaries were essential tools in the systematic followup of hypertensives.

The hypertension program's educational efforts had to be integrated into the comprehensive cardiovascular disease control effort because the main aim in providing health education to hypertensives was to prevent severe cardiovascular disease. Thus, hypertensives were given advice concerning smoking and dietary changes as well as about the control of high blood pressure.

Assessing Attainment of Objectives

The main objective of the hypertension program in North Karelia was to decrease high blood pressure (HBP) as a major risk factor in cardiovascular diseases by reducing high blood pressure levels in the whole population, but especially among middle-aged men. To further the aims of the overall project, hypertensives were given comprehensive treatment directed at other risk factors besides high blood pressure. The specific objectives of the hypertension program were to (*a*) find as many as possible of the hypertensives in the population who were in need of treatment, (*b*) keep the hypertension of these persons under control, (*c*) establish uniform and appropriate diagnostic and treatment procedures, and (*d*) collect new information on the occurrence of hypertension in the area and on the functioning of the area's health services (*8*).

Attainment of the objective of the overall project of reducing the impact of high blood pressure as a risk factor in cardiovascular diseases was evaluated by using data from a community-based infarction and stroke register and data on mortality, morbidity, and hospital discharges. To evaluate the fulfillment of the four specific objectives outlined in the preceding paragraph, representative population samples in North Karelia and a matched reference area were surveyed at the beginning and end of the 5-year study period to uncover risk factors and other pertinent data. Before, during, and after the 5-year period, other information was also collected to use in assessing changes in the risk factors and other pertinent factors.

The data in this paper were largely derived from the biannual followup postal surveys that were conducted in North Karelia throughout the study period to monitor the effects of the hypertension control program on the local population in terms of identifying and registering hypertensives and keeping the blood pressure of the registered hypertensives under control. Our data also came from the hypertension register that was established in the area, which in 1977 contained the names of 17,000 hypertensives. In each biannual

followup survey, an independent representative population sample 25–29 years old was used, with a participation rate of about 85 percent. In the main baseline survey (1972) and the terminal survey (1977), public health nurses and physicians in the study area and the reference area were surveyed simultaneously.

The intervention relating to hypertension carried out in North Karelia included, as has been mentioned, the training of health care personnel, health education about hypertension, and the organization of health services.

Training of Health Personnel

The training offered to local health care personnel to prepare them for participation in the hypertension control program was designed to be compatible with tasks they were already performing at the health centers. The main emphasis in the training was to promote the planned practical activities of diagnosis and treatment and the systematic health education and followup of hypertensives. The specific goals were (*a*) to standardize the diagnostic and treatment procedures of physicians, (*b*) to unify the techniques of the clinic nurses who were responsible for the followup and health education of hypertensives, and (*c*) to promote cooperation among the health care workers and the program staff. There was a particular need, especially among nurses but also among physicians, to increase and update their general and recent medical knowledge about HBP, augment their skills in its measurement, and improve their ability to educate hypertensives.

At the beginning of the hypertension program, a 1-week intensive course in hypertension control was arranged for the public health nurses, which was attended by 1 or 2 from each of the 12 health centers. This course consisted of 40 hours of lectures and practical exercises (including practice in blood pressure measurement) plus 2 to 3 hours of group discussion. The instruction dealt with hypertension and its treatment and the followup and health education of hypertensives. At the end of the course, the project staff discussed with each nurse how to establish a local hypertension dispensary.

The nurses responsible for the hypertension dispensaries held 1-day meetings 2 times each year during the study period, with 30 nurses participating in each meeting. At these meetings, participants discussed problems relating, for example, to the planning and implementation of the dispensaries' programs, the health education and followup of hypertensives, and problems relating to cooperation with physicians and the project staff. Lectures also were given on topics selected by the nurses relating to the treatment of hypertension.

The training of physicians was accomplished through seminars, written guidelines, and personal contacts with the project staff. The physicians attended the biannual weekend seminars of the North Karelia Project, which included lectures and discussions on the management of high blood pressure and analyses of cases. The purpose of the seminars was to apprise the physicians of recent medical advances in all aspects of cardiovascular disease, in particular, hypertension. The interchange and feedback among the physicians and the project staff concerning results and practical experiences were valuable to both groups.

The project staff also had frequent personal contacts with the physicians when individual problems and experiences in each health center were discussed. In addition, the physicians regularly received written feedback about the record forms that they sent to the central hypertension register. And visiting national and international experts often offered valuable advice to health care workers in the field.

A pamphlet, "Guidelines for Diagnosis, Treatment, and Follow-up of Hypertensives," which was prepared by the coordinating center of the project, was distributed to the physicians and public health nurses. Altogether, 12 memoranda dealing with different aspects of hypertension control were prepared and distributed to health care workers during the study period. Among the topics were guidelines for casefinding, diagnosis and treatment of hypertensives, arrangement of health services, establishment of hypertension clinics, and activities of the hypertension register.

At the beginning of the program, the project staff checked the quality of the sphygmomanometers used in the health centers and made recommendations as to what other devices should be available.

Health Education of the Public

Dissemination of information about hypertension was a part of the general health education effort of the North Karelia Project (*15*). The aim was to make people aware of hypertension as a risk factor in cardiovascular diseases, to stress the importance of proper treatment for elevated blood pressure, and to indicate the services offered for the screening, treatment, and followup of hypertension. Most of the public's health education about HBP was offered through newspapers and the radio. Health education materials, such as leaflets (printed in colors, 5–10 pages) about the treatment and followup of hypertension, the cessation of smoking, and weight loss, were distributed mainly during people's visits to the health centers for blood pressure measurements.

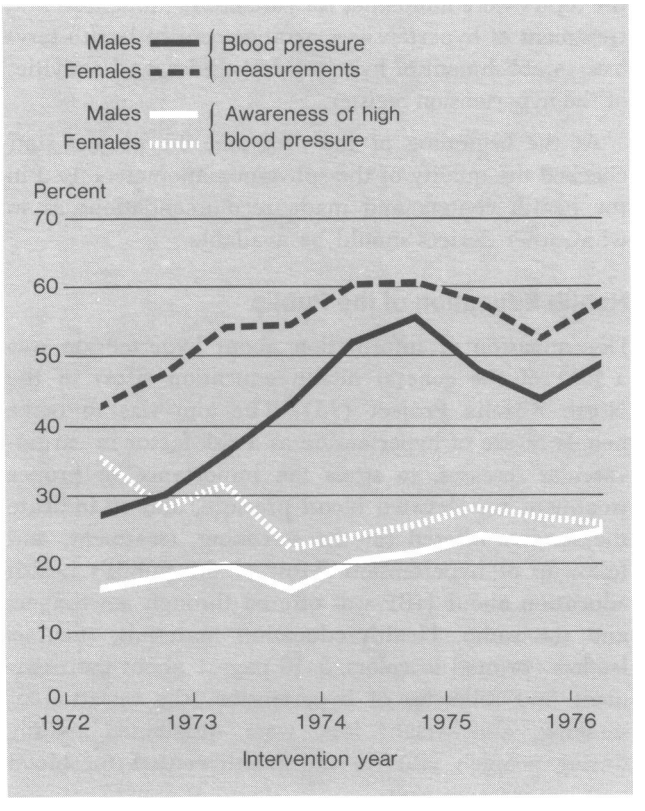
Table 1. Number of persons whose hypertension was detected by various screening methods, North Karelia, 1972–75

Mode of detection	Number of persons
On a visit to a physician	[1]115,000
Along with X-ray examination for pulmonary tuberculosis	41,400
As part of assessment of general cardiovascular risk in men	14,700
Along with cervical cancer screening	15,100
During health care at worksite and during any hospitalization	[1]70,000
Other	[1]25,000
Total	[1]281,200

[1] Approximate figure.

The newspapers in North Karelia published approximately 1,500 articles about the prevention of cardiovascular diseases during the 5-year intervention period; in 53 of these articles, hypertension was the main topic. The greatest newspaper coverage occurred during the first 3 years, the period of the project's development and systematization. A local radio station broadcast a 1-hour program in 1972 with facts and interviews about hypertension. Also, the current activities, progress, and results of the project were aired in several radio newscasts.

Figure 1. Percentage of the population of North Karelia who reported that their blood pressure had been measured during the preceding 6 months and percentage who were aware of their high blood pressure, according to followup surveys



Some 100,000 copies of a special health education leaflet about hypertension, prepared by the North Karelia Project staff, were supplied to hypertensives through the health centers; 25 percent of the population surveyed in 1977 reported that they had read this leaflet. The health centers also had on hand other materials about high blood pressure produced by the Finnish Heart Association, pharmaceutical companies, and other interested groups. Posters on cardiovascular disease were distributed for placement in various public places such as health centers and schools. One of these posters dealt exclusively with blood pressure.

Casefinding

One of the first tasks of the hypertension control program was to register hypertensives who were already in contact with the health care system. After that, detection of new hypertensives was a gradual process. Casefinding was based on measuring the blood pressure of all persons who visited a physician or public health nurse in the area and had not had their blood pressure checked recently. Simultaneously, screening programs were also conducted. For example, at the time of the X-ray examination for pulmonary tuberculosis that was obligatory in Finland for both sexes every 5 years, the blood pressure of about 40,000 residents of North Karelia over 30 years old was measured during the period 1972–77. In connection with the screening of middle-aged men for cardiovascular risk, which began in 1973 in line with recommendations of the North Karelia Project, 14,700 men had been screened for HBP by the end of 1977. At the screening of women over 30 years old for cervical cancer, which is conducted at the health centers every 5 years, 15,100 women were screened for hypertension during the 1972–77 period. Blood pressure was also measured at the time of other ad hoc screening procedures.

Blood pressure measurement during a visit to a physician was the most common means of detection of high blood pressure (table 1). A great proportion of the 100,000 North Karelian adults participated in hypertension screening at least twice during the study period.

The biannual followup surveys (*16*) showed that screening was most intensive in 1974 and 1975; approximately half of the middle-aged population in these surveys reported that they had had their blood pressure measured in the preceding 6 months (fig. 1). The followup surveys also demonstrated that "true awareness" by men of their HBP increased during the inter-

Table 2. Percentage distribution of persons aged 30–64 in North Karelia who were aware of their high blood pressure at time of the 1972 and 1977 surveys, by mode of detection of that condition

Mode of detection	Men		Women	
	1972 survey (N = 214)	1977 survey (N = 333)	1972 survey (N = 487)	1977 survey (N = 434)
Hospital investigation	19	9	9	9
Examination by physician	57	39	56	45
Screening	15	39	3	18
Examination by public health nurse	6	6	31	25
Other	3	7	1	3

vention period, from 16 percent in 1972 to 29 percent in 1977. In 1972, 16 percent of the total male population reported having elevated blood pressure, but when their blood pressure was measured, 27 percent were found to be hypertensive. In 1977, 24 percent of the males were hypertensive. On the other hand, 36 percent of the women in the 1972 baseline survey considered themselves to have high blood pressure, even though only 26 percent were actually hypertensive according to the study criteria (blood pressure 175 mm Hg systolic, 100 mm Hg diastolic, or both, or under hypertensive drug treatment). During the intervention period, this obviously "false awareness" was reduced, so that after the first 2 intervention years, the proportion of women reporting they had HBP was closer to the proportion that actually had it according to the study criteria.

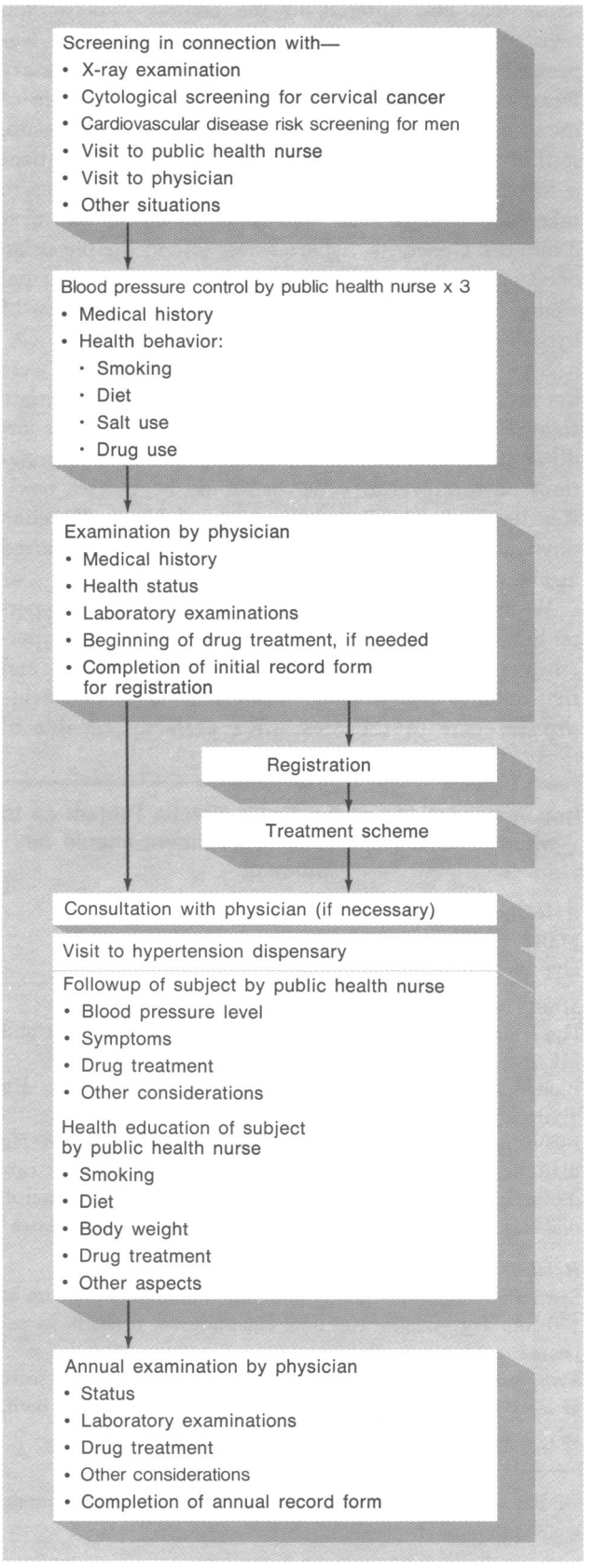
Although population surveys in 1972 and 1977 showed that a routine examination by a physician was the most common mode of detection of hypertension, this mode of detection became less common in the course of the intervention period, as the persons with HBP were increasingly detected by screening (table 2).

Treatment, Followup, and Health Education

Most of the hypertensives were treated by the staff of the local health centers. The physicians there were responsible for diagnosis and treatment. Generally, the centers had basic laboratory and X-ray examination facilities. The department of medicine at the central hospital of North Karelia was available for consultation if there was any suspicion of a secondary cause of HBP, severe organ involvement was found, or the patient did not respond to treatment. Only a small number of hypertensives were continuously treated at this hospital.

The initial examination by the physician consisted of checking the person's medical history and laboratory test results and performing a clinical examination. Once

Figure 2. Schema for the followup of hypertensives in North Karelia



the initial record form was completed, the patient's name was also entered in the central hypertension register, irrespective of whether drug treatment was prescribed. The physician decided on the necessary treatment and the intensity of followup. A couple of months before the patient's scheduled annual followup, staff of the project's coordinating center sent the patient a followup record form, which advised him or her to take the form and visit the physician within the next 3 months. Generally, hypertensives visited the physician once or twice annually. Figure 2 shows the principal elements in the detection, treatment, and followup of hypertensives in the North Karelia program.

Rigid blood pressure levels for drug treatment were not ordered by the project staff; the decision to initiate treatment rested with the local physicians. The coordinating center's staff, however, prepared recommendations on the level at which it should begin (see box). Results of the 1977 postal survey of North Karelian physicians showed that treatment was usually started at about 100 mm Hg diastolic pressure.

We realized early in the planning stage of the hypertension control program that the followup of hypertensives solely by physicians would be impossible and that public health nurses, who were available to provide primary care in the area, were perfectly capable of performing followup. A pilot hypertension dispensary, established at a health care center at the beginning of 1973 and successfully operated by a public health nurse, demonstrated that use of the nurses in followup was feasible. Later in 1973, five other hypertension dispensaries were started. Six more such dispensaries were established in 1974 and two more in 1975 at the remaining health centers. All of these dispensaries were run by nurses. When a person was found to have elevated blood pressure, he or she was asked to visit the hypertension dispensary for remeasurements. During these visits (usually about three in all), the public health nurse checked the person's medical history, smoking and dietary habits, consumption of drugs, and so forth. If the blood pressure was still elevated after at least three measurements, the person was advised to visit a physician.

On the average, hypertensives made four visits a year to the hypertension dispensary, during which the public health nurse measured the patients' blood pressure and checked their general condition, health behavior, compliance with the treatment prescribed, possible side effects of treatment, and the need for consultation with the physician.

Data from the hypertension register showed that during the first year of the control program, about 40 percent of the registered hypertensives had their blood pressure measured at least 9 times (table 3). Of those complying with their prescribed regimens, only 2 percent had only the annual followup examination without any other control measurements. During subsequent years, as blood pressure levels stabilized, these too frequent and unnecessary measurements became rarer.

Recommendations of the North Karelia Project as to when antihypertensive drug treatment should be initiated

Absolute indications:
Malignant and premalignant hypertension
Hypertensive encephalopathia

Strong indications:
Hypertension of World Health Organization's stages II and III
Blood pressure at least 175 mm Hg systolic, 105 mm Hg diastolic, or both, on repeated occasions [1]
Blood pressure at least 160 mm Hg systolic, 95 mm Hg diastolic, or both, in repeated measurements plus other cardiovascular risk factors (smoking, high serum cholesterol, diabetes) or family history of severe cardiovascular diseases [1]

Relative indications:
Symptomless patients 40–64 years old with blood pressure at 170 mm Hg systolic, 100 mm Hg diastolic, or both, in repeated measurements [1]
Symptomless patients 65 years or older with blood pressure at least 180 mm Hg systolic, 105 mm Hg diastolic, or both, in repeated measurements [1]

[1] Blood pressure limits may be 5 to 10 Hg higher among women than among men.

Duties of Health Care Personnel

The duties of the specially trained public health nurses who were in charge of the hypertension dispensaries were:

- to participate in the planning of the hypertension program for the health center,
- to be responsible for the day-to-day operation of the hypertension dispensary,
- to promote the health education of the hypertensives and persons with borderline hypertension,
- to establish a local information system,
- to educate other auxiliary health care personnel in the management of hypertensives, and
- to evaluate the activities of the dispensary.

The public health nurses were an important link between the hypertensives and the physicians and also between the health center and the coordinating center of the project. They participated in the planning and

Table 3. Percentage distribution of persons on the hypertension register by number of times their blood pressure was measured between their annual followup examinations

Annual followup examinations	Number of times blood pressure was measured—		
	0	1–8	9
	Men		
1st	2	59	39
2d	2	71	27
3d	2	73	25
4th	3	80	17
	Women		
1st	2	61	37
2d	2	71	27
3d	2	75	23
4th	2	81	17

establishment of such activities as arranging for the screening at the health centers.

Another essential part of their duties was the person-to-person health education of the hypertensives and other people visiting the dispensary. Through health education, the nurses sought to motivate patients to follow their drug treatment plans and visit the dispensary for regular followup, to stop smoking, to make changes in their diet (mainly with the aim of reducing body weight), and to increase their physical exercise.

In addition to the records in the central hypertension register, the public health nurses in each dispensary established a local information system. They checked the register for dropouts with the aid of a list (prepared by the staff of the project's coordinating group) of the persons who had not made their annual followup visits to their physicians.

Physicians at the local health centers were responsible for planning and carrying out the various activities of the hypertension program, as well as for treatment of the individual hypertensives. After the patient's initial examination, including diagnosis and a decision on the treatment required, the physician entered the patient's name in the hypertension register. Later, when laboratory and clinical examinations had been carried out during the registered hypertensive's annual visit, the physician filled in the register's annual followup record form.

Cooperation was close between the public health nurses and the physicians. The nurses normally were able to consult with the physicians daily. In contacts with hypertensives, physicians emphasized the need to change undesirable habits, thus supplementing the health education efforts of the nurses.

Table 4. Number of respondents in 1977 postal survey of physicians and public health nurses in North Karelia and a reference area

Category	Physicians		Public health nurses	
	North Karelia	Reference area	North Karelia	Reference area
Actively working in area	155	327	173	206
Excluded from study [1]	4	12	8	7
Number who responded in survey	115	239	154	186
Percentage that responded in survey	76.2	75.9	93.3	93.5

[1] Because they were included in the random sample of the population.

In the spring of 1977, at the end of the hypertension control program, a postal survey was carried out among the physicians and public health nurses in North Karelia and in a matched reference area in order to evaluate their opinions, participation, and experiences during the program (*21*). The number participating in this survey is shown in table 4.

Only 17 percent of the nurses in North Karelia, compared with 41 percent in the reference area, reported that they carried out daily more than 10 blood pressure measurements. Other than those public health nurses assigned to the hypertension clinics, public health nurses in North Karelia were less involved in measuring blood pressure than were the nurses in the reference area. This lighter involvement was a logical consequence of the way these services were set up in North Karelia, where the responsibility for blood pressure measurements was concentrated on the few nurses working at the hypertension dispensaries.

The finding that the North Karelian public health nurses consulted with a physician less often than their counterparts in the reference area (table 5) indicates that the North Karelian nurses worked more independently. On the other hand, those nurses in North Karelia who did several blood pressure measurements

Table 5. Percentage distribution of public health nurses by frequency of contacts with physicians, in North Karelia and a reference area

Frequency of contacts	Nurses working regularly in hypertension control		Nurses not working regularly in hypertension control	
	North Karelia (N = 46)	Reference area (N = 48)	North Karelia (N = 103)	Reference area (N = 135)
Several times daily	15	29	19	16
Once daily	15	17	15	14
Less often than once daily	70	54	66	70

Table 6. Percentage distribution of physicians by diastolic blood pressure level at which they would initiate antihypertensive drug treatment in a middle-aged male without cardiovascular risk factors or complications, in North Karelia and a reference area

Limits of blood pressure for initiating treatment	North Karelia (N = 109)	Reference area (N = 182)
–95 mm Hg	10	6
96–100 mm Hg	39	27
101–109 mm Hg	33	26
110– mm HG	18	41

NOTE: Percentages are based on data reported by the physicians in a 1977 survey.

Table 7. Percentage distribution of physicians and public health nurses by activities of their local health centers that they considered to be sufficient, in North Karelia and a reference area

Activity	Physicians		Public health nurses	
	North Karelia (N = 115)	Reference area (N = 239)	North Karelia (N = 154)	Reference area (N = 186)
Cardiovascular disease control: In general	52	18	49	7
Antismoking effort	45	30	34	19
Nutritional education	35	13	31	18
Hypertension control	79	42	90	47
Rehabilitation of heart disease patients	52	13	44	9
Health examinations	59	35	59	23
Function of the health center as a whole	43	42	38	39

Table 8. Hypertensives registered in North Karelia by year of registration and sex

Year of registration	Men	Women	Total	
			Number	Percent
1972 May–December	632	2,065	2,697	16
1973	1,721	3,559	5,280	31
1974	1,968	2,425	4,390	26
1975	1,211	1,630	2,841	16
1976–1977 (January–April)	804	1,007	1,811	11
Total	6,336	10,686	17,022	100

daily reported that they consulted daily with a physician, compared with only half of the nurses in the reference area.

North Karelian physicians seemed to start hypertension treatment at a lower level of diastolic pressure than their colleagues in the reference area (table 6). Furthermore, variation in the limit was less among North Karelian physicians, the majority of whom used 96 to 109 mm Hg as the upper limit. This level follows rather well the recommendation of the project staff (see box).

To obtain the opinions of health personnel about the program, the physicians and public health nurses were asked to indicate how adequate they considered the various cardiovascular disease control measures in their own health centers. Personnel in the two areas distinctly differed on this point: the North Karelian respondents were more satisfied with the CVD control activities in their area than were their colleagues in the reference area, especially in respect to hypertension control (table 7).

Hypertension Program's Information System

The aims of the hypertension register established at the beginning of the hypertension control program were (*8,16*):

- to register all the hypertensives in North Karelia,
- to ensure the followup of these hypertensives,
- to maintain the selected standards for treatment and followup,
- to give rapid, local feedback on the success of the treatment and followup of hypertensives in order to facilitate further development of the program, and
- to contribute to the overall evaluation of the hypertension control program.

After 5 years, there were 17,014 hypertensives on the central register. This was 9.7 percent of the total population of North Karelia and close to the proportion of hypertensives that would be expected in this population. The registration of hypertensives got off to a faster start among women than among men; 52 percent of all the women who were eventually registered in the course of the study program were on the register after 2 years, compared with only 37 percent of the men. At the end of the program, 63 percent of the hypertensives on the register were women (table 8).

In addition to the central register, a manual record for routine work was kept by the public health nurses in each hypertension dispensary. The nurses kept a card for each patient on which comments on each visit were recorded. (Information for the central hypertension register was gathered only once a year.)

Of course, registered hypertensives, like other pa-

tients, had their own medical files at the health centers, in which physicians entered their comments during the hypertensives' visits. Usually a special note was made on the record indicating that the patient was on the hypertension register.

A personal notebook given to hypertensives when they were registered comprised another part of the information system. The hypertensives were advised to show the notebook to health care personnel whom they contacted so that physicians and nurses would know that the patient was already on the register. The notebook also served as a means of exchanging information among health care personnel.

Success of Hypertension Control Program

The hypertension control program started gradually and developed continuously during the intervention period. The extent and speed with which it was expanded depended greatly on the resources of the individual health centers. Hypertension care in the health centers also developed gradually and depended on feedback of the experiences of the health care personnel. Toward the end of the program, more emphasis was put on ensuring continuation and stabilization of those activities that were regarded as feasible.

Surveys in 1972 and 1977 of independent random samples of the populations of North Karelia and a matched reference area (*19, 21,* and *22*) showed a significant increase in both areas in the awareness among hypertensives of their elevated blood pressure, but the increase was greater in North Karelia. The net change (change in North Karelia minus change in reference area) in the mean casual systolic and disastolic blood pressure was significant among both men—4/3 mm Hg—and women 5/4 mm Hg (both $P < 0.001$). The proportion of drug-treated hypertensives rose in both areas, but more significantly in North Karelia. The proportion of treated hypertensives who reached normotension also increased more in North Karelia than in the reference area (table 9). The net reduction in North Karelia in the prevalance of elevated blood pressure values ($\geqq$ 175 mm Hg systolic, $\geqq$ 100 mm Hg diastolic, or both) was also significant among both men (28 percent) and women (42 percent).

Comments

As mentioned at the beginning of this paper, there have been until recently no adequate reports on the systematic implementation of a community program of hypertension control. Information obtained from household surveys in the United States about the results of efforts to educate people about hypertension indicates that the percentage of hypertensives under adequate control has increased (*23*). It is, however, important for the success of future hypertension control efforts, to obtain valid information on the experience with pilot programs such as the one in North Karelia. And valid information can be obtained only by conducting a careful evaluation of the pilot program's implementation. In evaluating the program in North Karelia, we therefore assessed the feasibility and adequacy of the planned activities and analyzed the process by which they were implemented. Besides using detailed data on the program's practical implementation, we used soft data such as that obtained by asking the nurses to write the history of the implementation of the dispensaries in each health center. In this way we could analyze the situation as a whole and avoid falsely splitting and separating closely related activities. Based on this evaluation, we believe that consideration

Table 9. Percentages of different groups of hypertensives 30–59 years old in North Karelia and in a reference area who became normotensive 1972–77

Sex and hypertensive category	North Karelia		Reference area		Net percentage change in North Karelia	
	1972	1977	1972	1977	Absolute [1]	Relative [2]
Men						
Total	4	14	3	9	4	100
Aware of their high blood pressure	10	27	9	17	9	90
Under drug treatment	29	42	23	29	7	24
Women						
Total	5	39	8	21	19	380
Aware of their high blood pressure	8	44	13	27	18	225
Under drug treatment	17	57	25	41	24	141

[1] The result of subtracting the difference between North Karelia and the reference area in 1972 from the corresponding difference in 1977.

[2] The percentage of the absolute change from the value in 1972 in North Karelia.

NOTE: Persons with blood pressure of < 175 Hz mm systolic and < 100 mm Hz diastolic were considered normotensive.

needs to be given to defining the following elements when designing a hypertension control program in a community (*8,18*):

- the population at which the program is to be directed and the high-risk group,
- the method and criteria to be used in blood pressure measurement, the referral mechanism, diagnostic procedures, and the treatment regimen that will follow,
- the method and criteria for monitoring the compliance of program participants and for conducting surveillance for morbidity and adverse effects of treatment, and
- the criteria to be used in assessing the program's effectiveness, (that is, its contribution to the improvement of health).

The services offered to men in North Karelia, who, as has been noted, comprised the main target of the hypertension control program, were fairly similar at each health center and appeared to be sufficient and adequate for achieving a reduction in HBP. Any man at high risk of HBP was automatically screened. Hypertension casefinding was largely integrated into the existing activities of the health centers; only a few special additional screening procedures were arranged. Gradually, over the course of the project, all middle-aged residents were screened and even rescreened at 3- or 4-year intervals. At the beginning of the program, the methods for blood pressure measurement were decided upon and the devices for making the measurements were controlled. The education of personnel about diagnostic procedures, in which physicians and public health nurses willingly participated, was of great value.

Because the hypertension control program was an official part of the public health promotion in the County of North Karelia, its activities were regarded as normal functions of the health centers. Lack of motivation on the part of some personnel in the beginning had little effect on the program's implementation or the continuity of activities in the health centers as a whole. The fear of physicians that registration of hypertensive patients would cause them extra work dissipated with experience. The registration of hypertensives at all the health centers was based on widely accepted methods and criteria. The central hypertension register helped standardize diagnostic procedures, as well as contributed to the general education of the health care personnel.

Establishment of the hypertension control clinics did not require extra resources; it was achieved mostly by reorganizing the tasks of physicians and public health nurses at the local health centers. The experience of the North Karelian physicians and public health nurses shows the feasibility of a hypertension control program such as the one conducted in North Karelia. A comparison of North Karelia with the reference area that received no special intervention indicated that the activities in North Karelia had been carried out without any extra resources. In fact, a systematic program is likely to reduce uneconomic use of health services.

Staffs of the hypertension clinics paid particular attention to patients' compliance with recommendations for treatment and to adverse effects of treatment; overall monitoring of the patients was realized through the hypertension register. It made the registration and followup of the hypertensives feasible. Immediate monthly feedback of data from the register to the health centers had been planned, but in practice, proved impossible. Changes that occurred in the whole population as a result of the hypertension program were surveyed biannually by postal questionnaires (*24*). The hypertension register, along with the stroke and myocardial infarction registers in the study area, made possible the surveillance of morbid events. The hypertension register and the postal survey revealed the effects of the program on the whole community and provided sufficient feedback for the program's development. Also, personal contacts by the program staff with health care personnel provided valuable feedback for improving the organization of services.

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SYNOPSIS

NISSINEN, AULIKKI (University of Kuopio, Finland), TUOMILEHTO, JAAKKO, ELO, JYRKI, SALONEN, JUKKA, T., AND PUSKA, PEKKA: *Implementation of a hypertension control program in the County of North Karelia, Finland. Public Health Reports, Vol. 96, November–December 1981, pp. 503–513.*

A hypertension control program was established as part of the more comprehensive North Karelia Project. This project was started in 1972 in response to a petition from the population of North Karelia, a county in Finland, asking for national assistance to reduce the exceptionally high cardiovascular disease mortality and morbidity in the area. The North Karelia Project was carried out from 1972 to 1977.

The hypertension control program was implemented mainly in local health centers by physicians and public health nurses, who followed guidelines issued by the project staff and worked under its supervision.

Although the target population for the North Karelia Project was the entire population of North Karelia, the project focused on middle-aged men. The hypertension subprogram was introduced in steps. Its objectives included the training of health personnel, establishment of an information system in the county to educate people about hypertension, and organization of the detection, treatment, and followup of hypertensives. A hypertension dispensary was established in each of the 12 health centers in the county. Continuous training of the local public health nurses and physicians facilitated integration of the hypertension program into the operations of the health centers.

A central hypertension register and the hypertension control clinics at the health centers were the essential tools in the systematic followup of hypertensives. Some 17,000 hypertensives were on the register by the end of the 5-year project.

The main aim in providing health education about hypertension, as well as in treating hypertension itself, was to prevent severe cardiovascular diseases as a whole. Therefore the hypertension control program was integrated into the comprehensive cardiovascular disease control program, and hypertensives received advice concerning smoking and dietary changes as well as about high blood pressure.

A survey of health care personnel in North Karelia and in a reference area showed that the care of hypertensives was more systematic in North Karelia and that its health care personnel were more satisfied with the cardiovascular disease care that was provided.