ROLE OF INDUSTRY IN PREVENTIVE CARDIOLOGY

Introduction

James A. Schoenberger, MD

Before we can define the role of industry in preventive cardiology, we need to develop a case for the preventability of cardiac disease. My remarks, as well as those of the other panel members, will be directed only toward the prevention of coronary heart disease, the major cause of death in the United States, a disease which has assumed epidemic proportions here, as well as in other affluent, industrialized countries.

Years of epidemiologic research have demonstrated, both in the U.S. and throughout the world, that certain characteristics are associated with the future development of coronary heart disease. These risk factors explain most, but not all, of the variance of coronary heart disease in populations and are extremely useful in identifying the high risk individual. Even though a direct cause and effect relationship between risk factors and atherosclerosis is still partially inferrential, the concept that changes in risk status will alter the subsequent course of the disease form the basis for the field of preventive cardiology.

Although many characteristics have been shown to be related to increased risk, and probably many yet remain to be identified, only those which are capable of modification constitute a valid approach to intervention. Those which most clearly are related to risk, the so-called major risk factors, are the high fat, high cholesterol atherogenic U.S. diet, cigarette smoking, and hypertension. The inter-relationships between these major risk factors and the development of coronary heart disease are shown in Figure 1.

These data from Framingham show the inter-relationships between the three risk factors for a 50-year-old male. It can be seen that risk of coronary disease is a resultant of an inter-play of all three, that this risk can rise significantly with modest elevations of two or more risk factors and that most of us are far above ideal

FIGURE 1

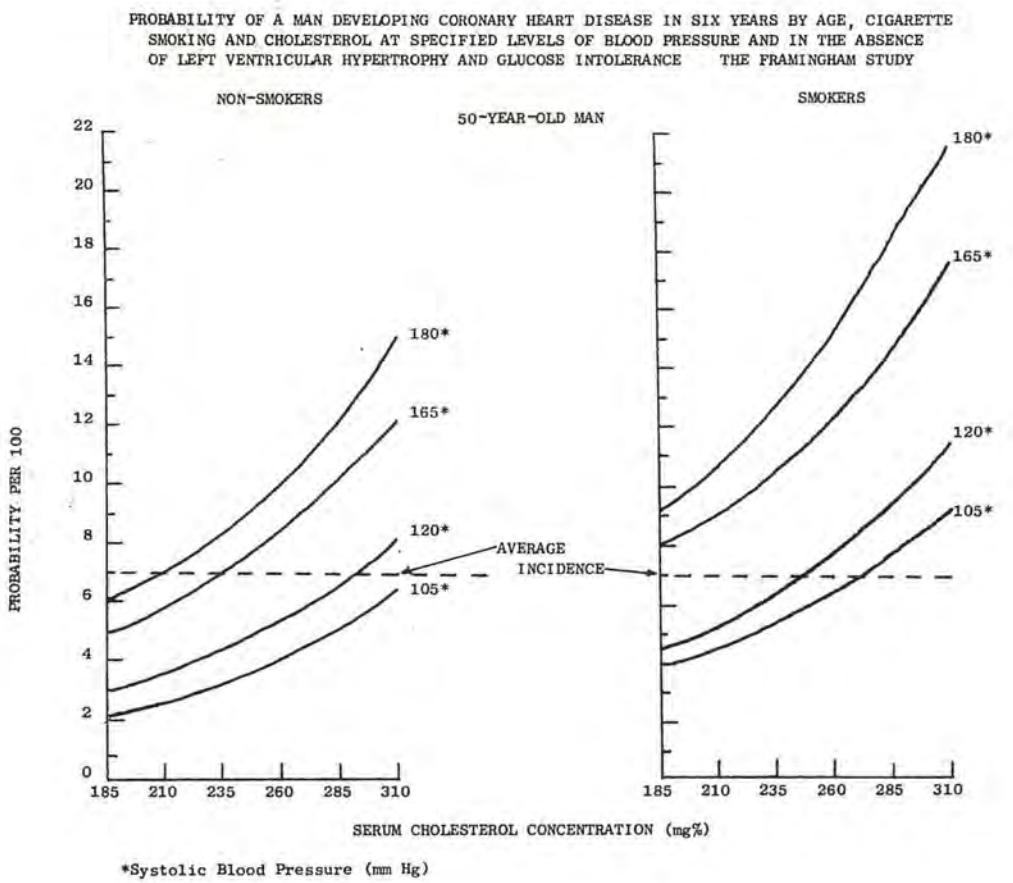
PROBABILITY OF A MAN DEVELOPING CORONARY HEART DISEASE IN SIX YEARS BY AGE, CIGARETTE SMOKING AND CHOLESTEROL AT SPECIFIED LEVELS OF BLOOD PRESSURE AND IN THE ABSENCE OF LEFT VENTRICULAR HYPERTROPHY AND GLUCOSE INTOLERANCE THE FRAMINGHAM STUDY
NON-SMOKERS
50-YEAR-OLD MAN
SMOKERS
PROBABILITY PER 100
22
20
18
16
14
12
10
8
6
4
2
0
180*
165*
120*
105*
AVERAGE INCIDENCE
185 210 235 260 285 310
SERUM CHOLESTEROL CONCENTRATION (mg%)
*Systolic Blood Pressure (mm Hg)

TABLE 2

PERCENT CHANGE IN HEART ATTACK DEATH RATES
U.S., 1968-75 BY AGE, SEX AND RACE

Age Group	White		Non-White	
	Male	Female	Male	Female
35-44	-23.6	-21.5	-27.7	-42.7
45-54	-17.8	-16.6	-21.2	-32.5
55-64	-17.6	-18.5	-21.7	-27.3
65-74	-17.8	-23.7	-19.3	-22.7

Note: Based on death rates per 100,000 population, 8th Revision ICDA Codes 410-413.

Mortality Source: Vital Statistics of U.S.
1968 - Vol. II, Part A
1975 - Personal Communication with Mortality Statistics Branch in Wash., D.C.

Population Source: Current Population Reports
1968 - CPR Series P-25, #519, Table 2
1975 - CPR Series P-25, #643, Table 2

risk by virtue of the widespread prevalence of risk factors in the U.S. The same data are shown in Table 1. This table from the Coronary Risk Handbook, prepared by the American Heart Association, contains similar tables for men from 35 to 65 and for women from 45 to 65. The Handbook is invaluable in the consulting room for the physician and future coronary victim alike.

If you will accept that we can identify the high risk individual by simple measures, what is the evidence that we can change the future by timely intervention? This has been amply demonstrated in the animal model, but evidence in the human is hard to come by. No definitive study has yet shown that a multiple risk factor intervention approach will prevent coronary heart disease. A large clinical trial, the Multiple Risk Factor Intervention Trial (MRFIT), designed to answer this question is underway, but the results of the trial are still five years away.

Meanwhile, most of us would agree that prudent measures, not harmful in and of themselves, such as changes in diet, cessation of smoking, treatment of hypertension, prescription of exercise, and reduction of excess weight have a potential benefit which justifies their recommendation now to the individual patient and even to the population at large before the final evidence is in.

I submit to you that the American public has already gotten the message and the single most important breakthrough in modern medicine is occurring under our very eyes. Table 2 shows what has happened in just the last seven years. Coronary heart disease is going down significantly for all age, sex, and race groups! This downward trend is the first breakthrough in the last 25 or more years.

Why this has happened is still a matter of speculation and debate. To me, the reasons seem clear. The consumption of animal fats and mean cholesterol has been going down steadily since the mid sixties. Thirty million Americans, mostly middle aged and male, have quit smoking. Cigarettes contain less tar and nicotine and produce less carbon monoxide. In just the last few years, more and more hypertensives have been identified and placed under effective treatment. I am prepared to accept that the dramatic downturn in the incidence of coronary heart disease is probably related to these major changes in the eating and smoking habits of the public.

TABLE 1

PREVALENCE OF HYPERTENSION IN %

1967 - 1973

Sex and Race	Age in Years 18-24	25-34	34-44	45-54	55-64	All
White men	9.3	11.3	17.5	29.1	40.1	21.1
Black men	7.4	16.3	22.5	40.0	50.8	23.3
White women	2.2	4.0	10.5	22.7	35.7	16.2
Black women	2.1	6.0	18.2	38.0	46.6	10.9
All	4.7	9.4	15.6	26.8	38.4	18.7

Hypertension: Systolic blood pressure $\geq$ 160 mm Hg or diastolic blood pressure $\geq$ 95 mm Hg or current medical treatment for hypertension

Chicago Heart Association
Heart Disease Detection In Industry

As physicians I feel we have an obligation to the public to bring these facts to the attention of our patients and to support, to the fullest, public health measures aimed at the reduction of saturated fat in the American diet and the elimination of cigarette smoking.

What Does All of This Have to do With Industry?
First, it should be obvious that a healthy work-force is probably the most valuable asset of any industry. Second, although I cannot document this, I believe that prevention can be cost effective. The costs of hiring and training new employees, the costs of health care insurance, the costs of disability insurance, the costs of disability and retirement benefits, the costs of death benefits are all considerable and, taken together, constitute a large part of the cost of doing business in America today. Any sensible business man ought to have more than a passing interest in reduction of these costs.

If, as I have shown, coronary heart disease is not inevitable, and the means for a prudent approach to prevention are at hand, this conference is very timely. It is time for industry to take a piece of the action. For too long, industry has been preoccupied with industrial accidents. These problems have largely been contained. The surface has not yet been scratched in industry's role at keeping workers healthy and free of heart disease. We need to determine what the costs of doing this will be. If they prove to be less than the costs of uncontrolled illness, it is easy to predict that, out of enlightened self interest, industry will move into the area of preventive cardiology.

Today we will discuss some measures which can be taken to control the risk factors in the industrial setting. At the outset it must be pointed out that there are great constraints against industry taking steps in those areas which involve personal habits of life style and confidentiality of personal health data. Whether industry can successfully influence how employees live in a favorable way is not known. Since there is an economic motive to attempt this, we will be exploring in this discussion how human behavior can be changed; for, in the final analysis, rampant coronary heart disease is an expression of aberrant human behavior-- eating, for whatever reason, the wrong diet, smoking cigarettes, and probably, to a great extent, developing high blood pressure.

The industrial site as a locus for intervention is suggested mainly because industry has a vested interest in conserving the health of workers and because nowhere else are workers concentrated so conveniently in time and place.

I shall now describe the potential for controlling hypertension at the work site. Then Dr. Agras will treat the problems of behavior modification regarding smoking and diet. Dr. Dedmon will tell us about new developments in the field of exercise programs at the work site. Finally, Dr. Stason will subject our speculations to the harsh light of cost effective analysis. Thus we may hope to sift out what is of proven benefit, how hard it will be to achieve, how much it will cost, and what it will be worth.

CONTROL OF HYPERTENSION IN INDUSTRY

A categorical approach to coronary prevention is indicated because we have the most experience in the area of hypertension. At one extreme, Dr. Alderman, working under union auspices, showed that it was possible to control a great majority of hypertensive workers who were seen on company time and received free drugs and medical care. This ideal approach is not always possible in this less than perfect world. I would like to describe the experiences in Chicago, a more typical situation, where my colleagues, Drs. Stamler and Ahekelle, and I have screened over 40,000 men and women at the work site. A great deal was learned from this experience and that knowledge should help to shape future programs, either single phase hypertension programs or multiphase comprehensive health programs.

In the first place, participation by the worker, in the American tradition, must be voluntary. Programs carried out on the worker's own time are less successful in recruitment of participants. Participation is jeopardized by concerns over the confidentiality of the findings. If the employee feels that the knowledge of his hypertension can be used to his disadvantage by management he would probably rather not know what his blood pressure is. The best way to circumvent this fear is to involve unions early in the planning phases of a program so that the issue of confidentiality can be dealt with. Finally, management also has fears regarding the carrying out of screening programs on company time. What is offered first as a good will gesture, however self-enlightened, becomes the basis for a perpetual fringe benefit for next year's contract at the negotiating table.

Because of these many considerations, the volunteer rate for screening programs varies widely. An average figure of 50-70% participation is realistic; but, when it is carried out under unfavorable auspices, such as poor pre-screening publicity and on individual time, the rate can be much lower. Obviously, the higher the rate the greater the potential impact of the program. As in other matters, the easier it is made for him to do, the more likely the worker is to participate.

Although the percentage of undetected hypertensives is reported to be falling, our data from Chicago for the years 1967-1973 would suggest that hypertension is very much a public health problem. On Table 3 the prevalence of hypertension, defined as a BP of $\geq$ 160 and/or 95 mm Hg is shown for various age, sex, and race groups. A problem which affects 18.7% of the working population is certainly a major one. Except for the younger ages, there is the usual preponderance in blacks and all groups show an ominous rise in prevalence with age to an average of 38.4% in the group 55-64.

The entire justification for screening is illustrated in Table 4. for age 25-44 and 45-64. Not only is hypertension common, but the majority of victims, men and women, black and white, either are unaware of it, are not getting any treatment if they do know of it, or are still hypertensive due to inadequate treatment. Although our data do not suggest that the Veterans Administration Studies demonstrating the value of treatment have had any impact on this situation, the National High Blood Pressure Education Program of the National Heart Lung and Blood Institute (NHLBI) claims that mass public and professional education is beginning to turn the corner on control of hypertension. Table 5 shows that the most recent studies would seem to indicate a favorable trend in detected and adequately treated hypertension. Evidence from another source - the Chec program - would support this conclusion. From this I infer that, although the public is better informed about hypertension, for properly selected target groups - such as younger individuals, particularly blacks - screening is still a necessary component of a hypertension control program.

In our program, individuals with blood pressure above the cutpoints established were referred to private medical care through a series of computer generated letters sent at monthly intervals. Compliance with the advice was signaled by the return of a postcard indicating

TABLE 3

THERAPEUTIC STATUS OF HYPERTENSIVES IN %

Age 25-44

1967 - 1973

Status	MEN		WOMEN		All
	White	Black	White	Black	
No prior diagnosis	67.6	69.7	56.6	49.2	64.8
Prior diagnosis, not treated	21.4	20.0	19.8	20.2	21.0
Treated, but pressure high	5.5	7.7	10.8	12.9	7.0
Treated and pressure not high	5.5	2.6	12.8	17.7	7.2

Chicago Heart Association

Heart Disease Detection in Industry

TABLE 4

THERAPEUTIC STATUS OF HYPERTENSIVES IN %

Age 45-64

1967 - 1973

Status	MEN		WOMEN		All
	White	Black	White	Black	
No prior diagnosis	58.8	62.9	47.0	35.7	59.2
Prior diagnosis, not treated	17.3	18.0	17.9	18.8	19.3
Treated, but pressure high	14.9	12.6	17.5	23.2	11.6
Treated and pressure not high	9.0	6.6	17.6	22.3	9.9

Chicago Heart Association

Heart Disease Detection in Industry

TABLE 5

PREVALENCE OF HYPERTENSION AND TREATMENT
FOR HYPERTENSION AT SCREEN I AND SCREEN II IN %

1967 - 1973

	Age ≤ 44 years (N = 2456)			Age ≥ 45 years (N = 1925)		
	Screen I	Screen II	P Value	Screen I	Screen II	P Value
Systolic BP ≥ 160	6.6	9.7	<0.01	17.8	28.9	<0.01
Diastolic BP > 95	6.9	9.0	0.01	15.3	19.4	<0.01
Systolic HP ≥ 160 or Diastolic BP ≥ 95	10.4	13.6	<0.01	22.5	33.1	<0.01
Treatment for Hypertension	1.5	2.5	<0.01	9.4	12.5	<0.01

Chicago Heart Association
Heart Disease Detection in Industry

the participant had seen the doctor. The results were always less than could be hoped for, especially in the younger ages. Thus, even before we deal with the problem of what the doctor will or will not do, we must accept that most screening programs, reaching a participatory rate of 70% and a successful referral rate of 60% will have a potential influence on much less than half of the individuals at risk. Is half a loaf better than none?

The impact of screening and referral programs cannot be evaluated solely by the numbers going through the process. The program should be designed to identify individuals with high blood pressure and get them under sustained, effective treatment.

We studied this by going back one to three years later to rescreen those same individuals to see what had happened. Table 6 shows that the prevalence of hypertension had gone up significantly. This discouraging finding may be in part attributed to the incidence of new cases, but the rather modest increase in the percentage of individuals on treatment at both age strata would suggest that the screening and referral process used by us had not truly been effective at inducing any lasting benefit. Most of the rise was in systolic blood pressure, confirming the well known fact that systolic blood pressure rises with age in industrialized countries.

CONCLUSION

These results might discourage further effort in the screening-referral method of dealing with the hypertension problem. But since there is such a large reservoir of undiagnosed and untreated hypertensions in the general population, and the situation is undoubtedly worse in the lower economic strata and the younger age groups, we cannot yet abandon this approach to correctly select target groups in the general population.

The methods need refinement and strengthening. We need to enhance participation in these programs, to improve successful follow-up contact for medical evaluation and treatment, more aggressive and effective intervention by the medical care system,and long term adherence by the individual with chronic, asymptomatic disease.

TABLE 6

COMPLIANCE WITH REFERRAL IN %

1967 - 1973

Sex and Race	Age In Years 25-44	45-64	All
White men	56.2	73.3	64.7
Black men	42.3	45.3	43.8
White women	65.7	76.3	71.0
Black women	52.5	37.5	45.0
All	56.2	73.1	64.6

Chicago Heart Association
Heart Disease Detection in Industry

In Chicago, we have modified our program in the light of our findings and these needs. The results of our second-generation program are preliminary and time does not permit their presentation today. It should be clear that the control of hypertension, as well as control of the other risk factors, is not a simple problem. Human behavior, the root of the problem in the first place, must be dealt with in new ways if we are to reach a solution.

NIOSH

OCCUPATIONAL SAFETY AND HEALTH SYMPOSIA 1977

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

OCCUPATIONAL SAFETY AND HEALTH SYMPOSIA

1977

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
Division of Technical Services
Cincinnati, Ohio 45226

June 1978

For sale by the Superintendent of Documents, U.S. Government
Printing Office, Washington, D.C. 20402

DISCLAIMER

The contents of this report are reproduced herein as received from the contractor except for minor editing. The opinions, findings, and conclusions expressed herein are not necessarily those of the National Institute for Occupational Safety and Health, nor does mention of company names or products constitute endorsement by the National Institute for Occupational Safety and Health.

NIOSH Project Officer: Loren L. Hatch, DO, PhD
Principal Investigators: Theodore C. Doege, M.D.
Robert H. Wheater, M.S.

Contract #210-77-0088

DHEW (NIOSH) Publication No. 78-169