

HYPERTENSION AND CARDIOVASCULAR RISK FACTOR EDUCATION AND EXAMINATION PROGRAM IN A LARGE INDUSTRY

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ABSTRACT

Screening programs for the detection of hypertension and cardiovascular risk factors were offered to the employees at the West Allis, Wisconsin plant of the Allis-Chalmers Corporation. The examination for hypertension was offered to all 6 261 employees, and 1 814 (30%) of them chose to participate. Of those participating 347 (19%) were found to be hypertensive; 224 (65%) of the hypertensive employees had satisfactorily controlled their blood pressures 6 months after the examination. A sample of 300 randomly selected employees was offered a complete examination for cardiovascular risk factors, and 148 (50%) of these employees chose to participate. For various reasons, 14 of these did not take the examination. Of the 134 employees actually completing the full examination, 28 (21%) were found to have significant abnormalities. Six months following the examination all 28 employees were under the care of private physicians and 19 (68%) had fully corrected their abnormalities.

In the past, the medical profession has generally chosen to ignore the "ounce of prevention" clause in the old aphorism, "an ounce of prevention is worth a pound of cure," and concentrated mainly on the administration of the "pound of cure." This was particularly true in occupational medicine which, until only recently, dealt primarily with the post-facto treatment of injuries as they occurred in the industrial environment. However, within the past few decades, the medical profession in general has become more concerned with expanding its preventive medicine programs. Occupational medicine has eagerly joined in at least some of these programs, and programs for the detection and treatment of hypertension have attracted more attention perhaps than any others. There are, I believe, several factors responsible for the recent concern for the detection and treatment of hypertension. First, the epidemiological studies begun in Framingham, Massachusetts in 1956 have shown conclusively that hypertension is one of the risk factors in the development of arteriosclerotic vascular disease in the brain, the heart, and the periphery^{7,8}. Second, the results of the cooperative Veterans Administration study demonstrated that the control of severely elevated diastolic blood pressure in males lowers the risk of stroke^{13, 15}. Third, hypertension is one

of the few diseases that can be detected during asymptomatic stages before organic damage occurs. Fourth, the screening test is painless and noninvasive, and if hypertension is detected at an early stage, effective treatment is available. Finally, the relatively low costs of programs for the detection and control of hypertension permit their administration in spite of the current rate of inflation and spiraling medical costs.

In the early 1970's several communities in the United States instituted programs for the detection of hypertension. At that time, it was discovered that between 10% and 20% of those participating in these programs were hypertensive. In some instances, the disease had previously been undetected while other patients knew they were hypertensive but had not been successful at controlling the disease^{9,12,17}. It became apparent that follow-up programs were frequently inadequate and many persons found to be hypertensive were not being properly treated. At about this time attention also began to be directed toward the industrial milieu as a possible site for the administration of programs for the initial detection of, as well as the subsequent control of hypertension^{1,4,5,6,10,14}. Among the advantages that may be cited for utilizing occupational locations as sites for hypertension screening and control programs are (1) the accessibility of the employees to the program, (2) minimal employee time lost due to participation in the program, (3) the availability of adequate employee medical insurance to cover the costs of necessary follow-up treatment, and (4) ease of locating the employee for follow-up treatment. Furthermore, many industrial installations already have medical departments in which both the detection and follow-up control programs can be performed with minimal, if any, increases in either cost or personnel. In 1974 Charman³ reported on a hypertension management program administered in Berlin, a small industrial community in New Hampshire. In this instance, the town was small enough that cooperation could be enlisted from virtually all of the doctors in private practice in that area. Charman reported that 86% of the patients were still complying with recommended treatment programs a year following the initial screening, but that after two years compliance with treatment recommendation, fell to only 62%^{3,16}. Elsewhere it has been noted that in larger communities compliance with treatment recommendations normally ranges between 42% and 68%^{9,12,14,17}. This drop in compliance with recommendations in larger communities is due partially to the difficulties of administering follow-up treatment to very large numbers of patients, and partially to the attitudes of the local practising physicians not all of whom consider the treatment of asymptomatic high blood pressure either necessary or desirable. So far, most industries have offered only programs for the detection of hypertension, while a few others have included follow-up blood pressure checks. In an effort to increase compliance with recommended treatment, one program offers initial screening as well as follow-up treatment at the occupational location. In this program 74% of the hypertensive employees complied with treatment recommendations^{1,2}.

Based on the results of a program we designed for the detection and control of hypertension in employees at the Bendix Corporation in Kansas City in 1974, and on more recent experience at the Allis-Chalmers Corporation, we believe that

the industrial setting offers one of the best, if not the ideal place, for the detection and control not only of hypertension, but of other cardiovascular risk factors as well. To test this hypothesis, we conducted an experiment that was designed to determine the employees' responses to voluntary programs for the detection and control of hypertension as well as other serious cardiovascular risk factors. For this experiment, which was carried out at the West Allis facility of the Allis-Chalmers Corporation, we were assisted by personnel from the Milwaukee Blood Pressure Program. The experiment actually involved two separate phases. First, since screening for hypertension can be done relatively quickly and inexpensively, a general hypertension screening program was offered to all the workers employed at the factory. Then, a program involving a more thorough screening examination for the detection of other cardiovascular risk factors was offered to a smaller number of randomly selected employees in the same factory. It was hoped that the employees would not only respond enthusiastically to the programs, but that the employees in whom cardiovascular risk factors were detected would comply with control recommendations to a degree at least as great as did those in the general hypertension screening program in whom hypertension was detected.

STUDY DESIGN

The Allis-Chalmers Corporation is a large, international special machinery manufacturing company in the United States with approximately 23 000 employees. Of this total, 6 261 employees work in the company headquarters in West Allis, Wisconsin. West Allis is part of the Milwaukee metropolitan area which has a total population of 1.3 million people. During November, 1977 the general hypertension screening and cardiovascular risk factor screening programs were offered to the employees at the West Allis plant. The first phase of the program, which involved screening for hypertension only, was offered to all employees and consisted of the following 8 steps:

1. Solicitation of approval by the Employee and Community Relations Directors of all division represented at the West Allis plant.
2. Notification of employees of the impending blood pressure screening program by means of a bulletin accompanying their pay checks.
3. Distribution and posting of bulletins which gave the details of the times and locations of the various blood pressure screenings.
4. Actual screening for hypertension at several locations throughout the plant. These screening sessions were accompanied by educational audio-visual presentations, and each employee who attended the screening was given a booklet which contained an outline of the presentation. Each employee's blood pressure reading was recorded on the booklet and an additional note was made if the employee was asked to have his or her blood pressure rechecked later.
5. All employees with blood pressure greater than 140 mm Hg systolic or 90 mm Hg diastolic were asked to return to the company medical

department during the following week for a second blood pressure check.

6. Those employees who were found to have elevated blood pressures on 2 or 3 consecutive readings were referred to private physicians for treatment and were encouraged to return to the company medical department regularly to have the results of their treatment monitored.
7. Those employees who did not have private physicians were aided by the medical department personnel in quickly finding personal physicians; with the consent of the employees all of the findings of the Allis-Chalmers medical department were made available to their private physicians.
8. Follow-up has extended to 6 months.

The second portion of the program, which consisted of an extensive examination for several cardiovascular risk factors, was offered to only 300 employees, 150 each randomly selected by a computer from the hourly and salaried groups. Hourly workers are mostly union members and include machinists, assembly line workers, and so forth. Salaried employees, whose wages are calculated on the basis of a monthly rate, are generally not union members. Included in the salaried group are managers, supervisors, professional and clerical workers, and the like. This portion of the program was designed as a comprehensive screening and education program for cardiovascular risk factors. The following procedure was followed:

1. A form letter inviting them to participate in the program was sent to each of the 300 selected employees.
2. Those employees who indicated their desire to participate in this portion of the program were scheduled for thorough examinations which included complete histories, physical examinations, blood chemistry screenings, urinalyses, chest X-rays, electrocardiograms, and pulmonary function tests. In the event a particular employee had had a complete physical examination within the previous 6 months the results of that examination were accepted in lieu of another examination.
3. Employees in whom abnormalities were detected were counseled and, if they did not have private physicians, referrals were made.
4. Follow-up has extended to 6 months.

RESULTS

In the general hypertension screening portion of the program a total of 1814 employees had their blood pressures checked. This is 30% of the total employee population at the West Allis plant (Fig. 1). Of those screened, 80.9% were found to be normal on either the first or second blood pressure reading. A total of 347 employees was found to have abnormally elevated blood pressures on two or more occasions. The status of these 347 employees 6 months after the screening is shown in detail in Figure 2. This shows that 224 or 64.6% of these patients were placed on medication and/or diet which effectively controlled their blood pressures. Another 4% of these employees are currently on medication, but

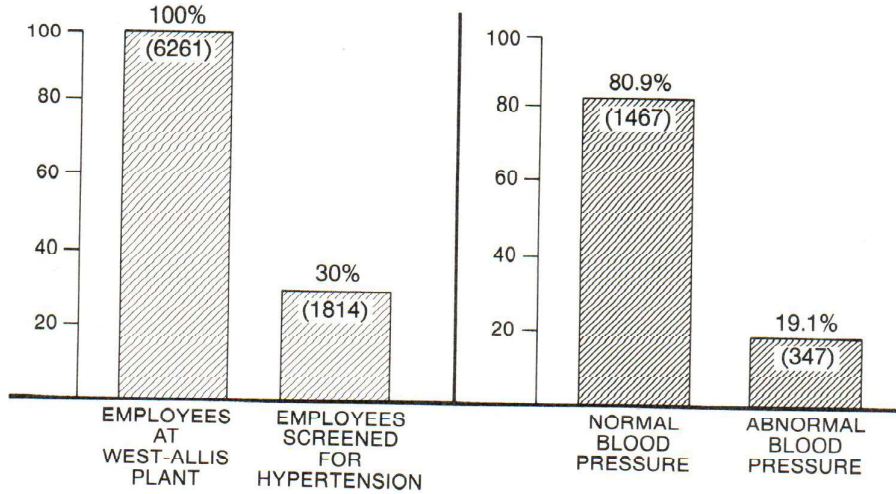


FIG. 1 - Number of employees participating in screening for hypertension at Allis-Chalmers West Allis plant.

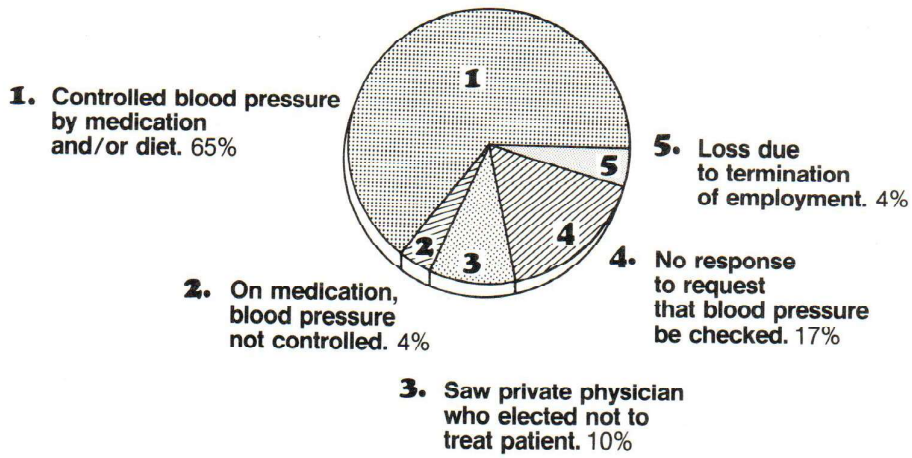


FIG. 2 - Results in 347 employees with elevated blood pressure.

their blood pressures are not yet under effective control. A total of 36 (10.4%) employees visited their doctors but their doctors did not prescribe treatment. In some instances this was because the blood pressures were only slightly elevated. The remaining 20% of the employees were lost to follow-up either because of termination of employment or because they did not respond to repeated requests to return to the medical department for rechecks of their blood pressures.

For approximately 90% of the employees screened in this part of the program data regarding their salary status, sex, and age were available. Table 1 shows the numbers of hourly versus salaried employees. When the program was started many interested parties felt that the hourly employees might not participate because they feared that elevated blood pressure readings would affect their employment statuses. As can be seen, however, the hourly employees actually responded slightly better than the salaried employees.

TABLE 1
Employees screened for hypertension according to employment status.

GROUP	NUMBER SCREENED	TOTAL EMPLOYEES AT WEST ALLIS PLANT	%
HOURLY	817	2899	28.2
SALARIED	835	3362	24.8
TOTAL	1652	6261	26.4

Table 2 shows the age and sex of the employees who responded to the invitation for participants. In a previous study Schoenberger¹¹ noted that employees over the age of 45 tended to respond to this type of program better than younger employees, especially young male employees. The results of our study show that the difference in the response rate between males and females

TABLE 2
Employees screened for hypertension according to age and sex.

AGE	MALES NUMBER SCREENED	TOTAL MALE EMPLOYEES AT WEST ALLIS PLANT	%	FEMALES NUMBER SCREENED	TOTAL FEMALE EMPLOYEES AT WEST ALLIS PLANT	%
-29	276	1084	25.5	78	291	26.8
30-39	226	1047	21.6	35	150	23.3
40-49	301	1068	28.2	41	168	24.4
50-59	472	1611	29.3	79	260	30.4
60-	115	518	22.2	13	64	20.3
TOTAL	1390	5328	26.1	245	933	26.3

varied from 1.3% to a maximum of 3.8% and there is nothing to support Schoenberger's conclusion that older persons, especially females, tended to respond better than younger males.

Of the 300 employees invited to participate in the cardiovascular risk factor screening portion of the program, 208 responded to the letter of invitation (Fig. 3). Of the total who responded, 148 indicated their desire to participate in the study while 60 indicated that they would not participate. In contrast to the hypertension screening portion of the program in which only about one-half were salaried employees, nearly two-thirds of those wishing to participate in this portion of the program were from that group. Among those wishing to participate were 14 employees who did not complete the program, 6 employees whose foremen would not release them from work, and 8 employees who had had recent physical examinations and whose doctors did not respond to our requests for information.

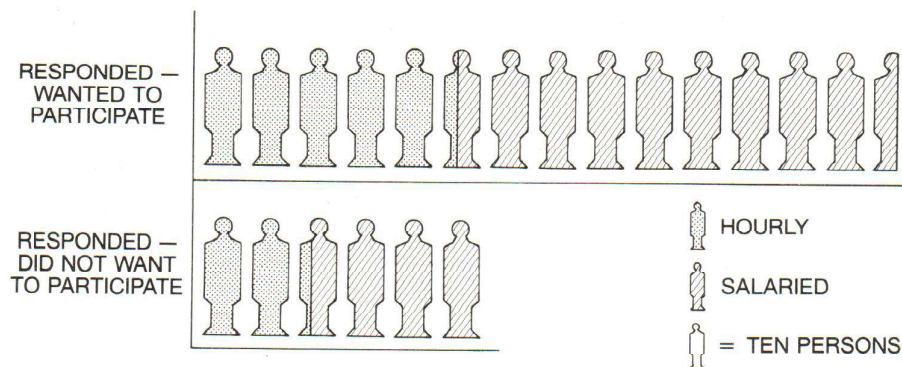


FIG. 3 - Response from 300 employees offered an elective physical examination to screen for cardiovascular risk factors.

Of the 134 employees who completed this portion of the project, 106 were normal and did not require follow-ups while 28 showed abnormalities. At the follow-ups 6 months later, 19 of these employees were following recommended corrective regimens and had controlled their abnormalities. The remaining 9 employees still had abnormalities (Fig. 4). It would appear that approximately two-thirds of the employees who showed abnormalities at the times of their physical examination responded successfully to corrective recommendations. The number of employees upon which the cardiovascular risk factor screening portion of the program was based is so small that an absolutely valid statistical comparison of the response rates between the two groups cannot be made. Nonetheless, the results of this study do show that the percentage of successful correction of abnormalities was 3.2% greater in the cardiovascular risk factor screening portion of the program than in the general hypertension screening portion.

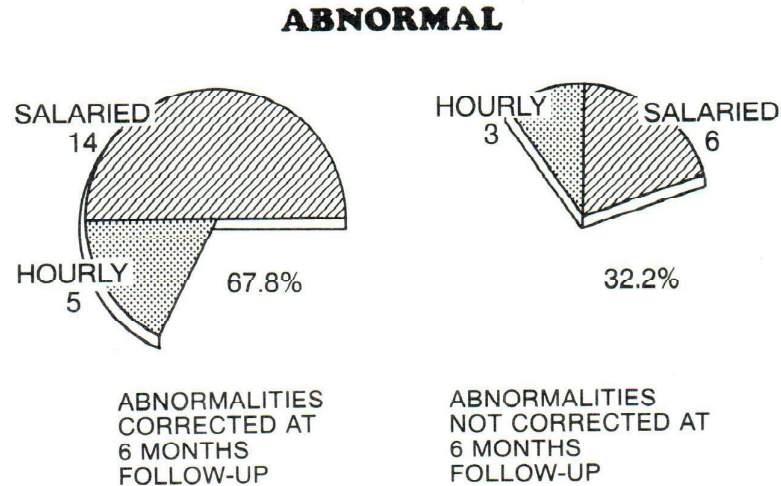


FIG. 4 - Examinations for cardiovascular risk factors in 134 employees. Results in 28 employees with detected abnormalities.

ACKNOWLEDGEMENT

The cardiovascular risk factor screening program was conducted entirely within the Allis-Chalmers medical department utilizing existing personnel and facilities. As noted earlier, volunteers from the staff of the Milwaukee Blood Pressure Program helped the Allis-Chalmers medical department personnel take blood pressure during the general hypertension screening portion of the program. Follow-up contacts and blood pressure recordings were done exclusively by nurses and secretaries in the Allis-Chalmers medical department during regular working hours.

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