

Incidental Blood Pressure Elevations: A MIRNET Project

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Background. A prospective study was undertaken to determine the prevalence of hypertension in office patients with an incidental diastolic blood pressure greater than or equal to 90 mm Hg.

Methods. During routine screening of 14,890 patients, 174 patients with elevated diastolic blood pressures but no previous diagnosis of hypertension were identified over a 3-month period. Only 115 (64%) returned as requested for two subsequent blood pressure readings.

Results. Sixty percent of those returning fit the definition for hypertension using the criteria of the Joint National Committee on Detection, Evaluation, and Treatment of Hypertension. Sixty-nine percent (43/62) of the men and 49% (26/53) of the women

were hypertensive. Women under 40 years old were less likely to be hypertensive, but age did not predict hypertension in men. Among those patients with a diastolic pressure reading below 105 mm Hg, progressively higher diastolic readings on the first visit did not predict a higher probability of hypertension. Among those patients with a diastolic pressure reading above 105 mm Hg, however, 90% (9/10) were hypertensive.

Conclusions. Physicians should take incidental elevation of diastolic pressure seriously because of the high prevalence of confirmed hypertension in this group of patients.

Key words. Blood pressure determination; hypertension; patient compliance. *J Fam Pract* 1991; 32:378-381.

In the last two decades, several major studies have described the prevalence of hypertension in the US population. The best known and most often cited are the Hypertension Detection and Follow-up Program (HDFP) Cooperative Group¹ and the Community Hypertension Evaluation Clinical (CHEC) Program.² These studies focused on community outreach programs designed to determine the prevalence of hypertension among the general population. A number of studies from Great Britain have described hypertension screenings in general practice settings.³⁻⁷ Most notable of these is the 1970 study by Hart,³ who screened 98% of the adults aged 20 to 64 years in his small industrial village of Glyncorrwg, South Wales. These British studies have shown that hypertension screening is feasible in the office setting, and that office screening identifies a significant number of unknown hypertensive patients.

Stason and Weinstein⁸ concluded from their study

of patient compliance that efforts to reduce hypertension through public screening programs is effective only if resources for long-term follow-up care are available.⁸ The primary care physician has the greatest opportunity for longitudinal contact with patients. To have any major impact on the nationwide control of hypertension, primary care providers must be diligent in following patients with histories of elevated blood pressure readings. Knowing which patients with incidental elevated blood pressure readings are most likely to be hypertensive can help the physician in directing more intensive health promotion efforts toward those at highest risk.

This study was designed to determine which patients with a single incidental elevated blood pressure reading in the office are most likely to be hypertensive. A second goal was to compare primary care office data with the findings of two major hypertension screening studies, the HDFP study and the CHEC study.

Methods

The population for the study was the patients of the Michigan Research Network (MIRNET), a voluntary research association of family physicians in Michigan. Patients were identified prospectively from 13 MIRNET

Michigan Research Network (MIRNET) is a voluntary collaboration of Michigan family physicians interested in performing practice-based research.

Submitted, revised, October 16, 1990.

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practices over a 3-month period, from January 1985 through March 1985. The 13 practices were well-established solo or small group family practices, with the exception of one, which was a university faculty group. Both male and female patients were included in the study based on the following criteria: The patient (1) had no previous confirmed diagnosis of hypertension; (2) was between 20 and 65 years of age; (3) had an initial diastolic blood pressure reading at the time of the office visit of greater than or equal to 90 mm Hg; (4) had scheduled the office visit for reasons other than suspected hypertension; and (5) was not pregnant.

Both new and established patients were included in the study. Each patient's age, sex, and initial diastolic blood pressure level were entered on a master data sheet. The patient was told of the elevated blood pressure, and standard instructions were given to the patient to return for two more random blood pressure readings at least 1 week apart. The patient was informed that this was necessary to further define the significance of his or her elevated blood pressure reading. No reminder was given by phone or mail.

At each visit, three readings were made within 3 minutes after a 5-minute rest. Phase 5 of Korotkoff sounds (disappearance of sound) was designated as the diastolic blood pressure. Pressure was taken from either arm and while the patient was seated. The average of the three diastolic readings was recorded at each visit. This method follows the American Heart Association recommendations,⁹ and is the method used in the Veterans Administration Cooperative Study¹⁰ and the HDFP study for diagnosis of hypertension. Patients were determined to be hypertensive when the average of the three diastolic blood pressure readings taken during at least two of the three visits was greater than or equal to 90 mm Hg; this is the definition of hypertension used in the 1984 report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure.¹¹

Patients who returned within 2 months after completion of the initial study were called the early follow-up group. No mail or telephone reminders were given to prompt this group of patients to return. The remaining patients were contacted by phone 6 months after completion of the initial study and reminded to make the follow-up visits. Those who returned to complete the three visits at this time are called the late follow-up group. Their data were analyzed separately. Those who did not make the two follow-up visits constitute the no follow-up group.

Comparisons between groups by age, sex, and level of initial blood pressure readings were made using the

Table 1. Hypertension Confirmed in Combined Early and Late Follow-up Groups with Incidental Diastolic Blood Pressure Elevation

Groups	Total Number Screened	Number of Hypertensive Patients	Hypertension Rate
All patients	115	69	60
Men	62	43	69
Women	53	26	49

chi-square test with one degree of freedom. Ordinal data were analyzed with the Student's *t* statistic.

Results

Of 14,890 patient encounters, 174 patients (1.2%) had an initial diastolic pressure greater than or equal to 90 mm Hg. Two months after the entrance of the last participants, 88 patients had completed three visits for blood pressure readings (early follow-up group). Of the 86 remaining patients, 52 were reminded by telephone of their visits. Only 27 of these returned for the two follow-up visits (late follow-up group). Fifty-nine patients (34%) of the 174 identified with elevated diastolic pressure failed to return (no follow-up group).

Combining the early and late follow-up groups, 69 of 115 patients (60%) had confirmed hypertension. Forty-three of the 62 men (69%) and 26 of the 53 women (49%) were hypertensive ($P = .043$) (Table 1).

The overall hypertension rate for the early follow-up group was 65% (Table 2). There was a significant difference between men and women. Seventy-seven percent of the men (33/43) were hypertensive, compared with 53% of the women (24/45) ($P = .038$). Among women younger than 40 years with initial diastolic pressures between 90 and 100 mm Hg, 38% (6/16) were diagnosed as hypertensive, compared with 67% (12/18) of those 40 years and older. This difference was not statistically significant ($P = .175$). No age difference was noted in men.

Progressively higher diastolic readings on the first visit did not predict a higher probability of hypertension as compared with the entire group until the diastolic

Table 2. Hypertension Confirmed in Early Follow-up Group with Incidental Diastolic Blood Pressure Elevation

Group	Total Number Screened	Number of Hypertensive Patients	Hypertension Rate
All patients	88	57	65
Men	43	33	77
Women	45	24	53

Table 3. Incidental Diastolic Blood Pressure Levels as Predictors of Diagnosed Hypertension

Diastolic Blood Pressure Levels (mm Hg)	Number of Patients Screened	Diagnosis of Hypertension No. (%)
90-94	47	27 (57)
95-99	26	17 (65)
100-104	8	4 (50)
>104	7	7 (100)
All	88	57 (65)

$P < .0001$.

reading was greater than or equal to 105 mm Hg. At that level of blood pressure, all of the patients (7/7) were subsequently diagnosed as hypertensive ($P = .001$) (Table 3).

In the late follow-up group, the overall hypertensive rate was 44% (12/27). Two of the 8 women (25%) were hypertensive, and 10 of the 19 men (52%) were hypertensive. Two of the three patients with diastolic blood pressure readings greater than or equal to 105 mm Hg were hypertensive. The small sample size of this group precluded statistical analysis.

Discussion

The overall hypertension rate of 60% in this study is comparable to the CHEC group rate of 67% and the HDFP group rates of 71% for blacks and 61% for whites. Though the CHEC study found confirmed hypertension more often in women, the present study and the HDFP group found hypertension to be significantly more common in men who had an elevated diastolic pressure reading. In the present study, the difference between men and women can be explained by the lower prevalence of hypertension in women younger than aged 40 years (38%). Our study suggested that women younger than 40 years old are more likely to have labile blood pressure readings and less likely to be truly hypertensive than older women and men of all ages. This trend needs to be confirmed in a larger study group.

Age did not influence the rate of hypertension among men in this study. This finding varies from the CHEC study in which increased age was associated with increased hypertension rates. Our findings indicate a need for diligent follow-up of all men who have a random elevated blood pressure reading. Again, a larger study group is necessary to confirm this trend.

In this study, progressively higher initial diastolic readings did not predict a higher probability of hypertension unless the diastolic readings were 105 mm Hg or greater. This finding is comparable to that of the HDFP study, which found hypertension to be an average of

20% more likely in those with diastolic readings of 105 mm Hg or greater, compared with those with initial diastolic readings of less than 105 mm Hg (80% vs 60%). A diastolic blood pressure reading of 105 mm Hg or greater most likely indicates hypertension and may warrant early intervention.

Of interest is the low frequency of elevated diastolic pressures in office patients presenting for reasons other than hypertension. In only 174 of 14,890 office encounters (1.2%) was an unsuspected elevated diastolic pressure noted. This low frequency suggests that most of the hypertensive patients in these practices were identified previously. This study did not tabulate how many of the 174 patients were new to a practice. One would suspect that new patients would have a higher prevalence of undiagnosed hypertension as compared with established patients.

The poor patient compliance in keeping the two follow-up visits in this study must be addressed. Of concern was the inability of the physicians to convince 59 (34%) of the patients to return for any follow-up. This large group of nonresponders makes our conclusions about hypertension rates tentative. Silman and Locke¹² found no association, however, between diastolic blood pressure and the amount of effort needed to bring the patient to screening in two British general practices. Also, the CHEC study reports that the level of initial blood pressure reading did not influence the follow-up rate. The present study supports this observation, since there were no major differences in initial diastolic reading distributions between the early and late follow-up groups. Nonetheless, uncertainty remains about the prevalence of hypertension in patients with an elevated diastolic pressure who fail to return for follow-up.

Although the overall hypertension rate in our late follow-up group was less than the rate of the early follow-up group, trends by sex were similar. The need remains for long-term follow-up of the rates of hypertension in patients who are "very compliant" as compared with "moderately compliant" and "noncompliant."

Several British studies have shown that letter reminders improved patient compliance with hypertension screening follow-up.¹³⁻¹⁵ One practice used a computer program that indicated when patient follow-up visits were due and generated a reminder letter; this practice site was able to sustain a continuous screening rate of 90% to 95%.¹⁵ Further hypertension screening studies should use such methods to increase follow-up rates.

This study is limited in that its case findings were based only on the diagnosis of diastolic hypertension. Some patients with isolated systolic hypertension may have been missed, although the majority of patients with systolic hypertension are over 65 years of age.

Furthermore, the phenomenon of "white coat hypertension" was not addressed. Pickering et al¹⁶ found that 21% of 292 patients with untreated borderline hypertension (those with diastolic pressures persistently of 90 to 105 mm Hg) have normal daytime ambulatory pressures.

In summary, the rate of diastolic hypertension in office patients aged 20 to 65 years with an incidental blood pressure elevation was similar to rates reported in larger epidemiologic studies. Men were more likely to be hypertensive than women. Women younger than 40 years with diastolic blood pressures of 90 to 100 mm Hg were less likely to be hypertensive regardless of age. Initial diastolic blood pressure readings greater than or equal to 105 mm Hg were much more likely to indicate hypertension. All of these preliminary findings need to be confirmed in a larger study. Future studies should stress aggressive follow-up of nonresponders. Clearly, physicians should take incidental elevation of diastolic pressure seriously because of the high prevalence of confirmed hypertension in this group of patients.

Acknowledgment

The following Michigan family physicians and their staffs participated in this study: Avery Aten, MD, Alpena; Kenneth Berncis, MD, Otsego; Robert Clouse, MD, Fremont; C. Edward Cotton, MD, Marcellus; John Hickner, MD, Escanaba; Werner Hollstein, MD, Holt; Ray Koivunen, MD, Iron River; Dough McKeag, MD, E Lansing; Jim Peggs, MD, Chelsea; Tom Teal, MD, Chesaning; Tom Tobolic, MD, Byron Center; Cherolee Trembath, MD, South Lyon; and Bill Wadland, MD, Algonac.

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