

# Prehypertension and hypertension in a primary care practice

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## ABSTRACT

**Objective.** To assess the prevalence of prehypertension and the prevalence and treatment of hypertension in a family practice population.

**Design.** Cross-sectional study.

**Setting.** An academic family practice unit.

**Participants.** Practice patients aged 30 to 80 years who had visited the clinic at least once during the 2 years before the study and had at least 1 blood pressure (BP) measurement recorded on their charts during that time period.

**Main Outcome Measures.** Most recent BP recorded on the chart; presence or absence of a diagnosis of hypertension recorded on the chart; number and class of prescribed antihypertensive medications.

**Results.** Of the 1388 patients who met the inclusion criteria, 389 had a diagnosis of hypertension. Of the 999 who did not have a diagnosis of hypertension, 306 (30.6%) met the criteria for prehypertension used in this study (systolic BP of 130 to 139 mm Hg or diastolic BP of 85 to 89 mm Hg). Men and older patients (60 to 80 years of age) were more likely to have prehypertension than other patients were. Of the patients with hypertension, 254 (65%) had achieved a BP level of < 140/90 mm Hg. The majority of hypertensive patients were prescribed 1 or 2 medications. Only 4.5% were using more than 2 different medications.

**Conclusion.** A large proportion of a family practice's patients need close surveillance of BP because of the prevalence of prehypertension. Despite the improvement in the management of hypertension, only 65% of hypertensive patients had achieved the recommended target BP. Family physicians could be treating their hypertensive patients more aggressively with medications; only 4.4% of patients were using more than 2 different antihypertensive medications, despite 35% not being at target. Hypertension surveillance and treatment to achieve target BP levels continue to be important issues in primary care.

The positive relationship between blood pressure (BP) and cardiovascular risk has been well documented. (1,2) This correlation is noted in men and women, younger and older adults, and individuals from various ethnic and racial backgrounds. (3-5) Worldwide, approximately

7.1 million deaths per year are attributable to hypertension – defined as a systolic BP of (3) 140 mm Hg or a diastolic BP of (3) 90 mm Hg. (6) This positive relationship has been shown to exist not only in those with high BP, but also in individuals with high-normal BP. (7)

The increased risk associated with high-normal pressures was the focus of the Seventh Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). The JNC 7 report was released in May 2003 (6) and included the addition of a BP category called *prehypertension* (systolic BP of 120 to 139 mm Hg or diastolic BP of 80 to 89 mm Hg). Now, individuals who were previously considered to have normal BP levels were placed in a category of prehypertension, implying increased risk. Persons with prehypertension have been shown to be at increased risk of developing hypertension. (6-10) A US study including more than 5000 patients found that those classified as prehypertensive were more likely to develop hypertension over the 50-year follow-up period, suffer a myocardial infarction, and develop coronary artery disease than those individuals in the healthy BP category. (8) The primary goal of the new classification system is to increase the awareness of those with prehypertension and to call for lifestyle modifications in persons with this increased risk. (6)

In a report of the Strong Heart Study, (10) the cardiovascular disease (CVD) outcomes in prehypertensive patients were compared with normotensive patients over a 12-year period. The hazard ratio for development of CVD was 1.8 (95% confidence interval [CI] 1.28 to 2.54) for prehypertension compared with normotension. The study defined the prehypertension category as a systolic BP of 120 to 139 mm Hg or a diastolic BP of 80 to 89 mm Hg. In a larger study, (11) of 9000 patients – based on the National Health and Nutrition Examination Survey – 47% had hypertension, 33% had prehypertension, and 20% were normotensive. Patients were followed for 18 years. After controlling for other risk factors, only the upper end of prehypertension (systolic 130 to 139 mm Hg or diastolic 85 to 89 mm Hg) was significantly associated (hazard ratio 2.13, 95% CI 1.64 to 2.76) with increased risk of CVD. For this reason, BP levels in the range of 130 to 139 mm Hg systolic and 85 to 89 mm Hg diastolic were categorized as prehypertension in our study.

Because the JNC 7 report suggested that prevention, screening, and treatment practices be based on this new criterion for prehypertension, it is necessary to document the prevalence and trends of this condition in the patient population. Although we do hasten to add that the Canadian Hypertension Education Program has not yet adopted *prehypertension* in their language or

definitions; they continue to use the term *high-normal BP*.

There are other issues in the management of hypertension in primary care. Reports suggest (12-17) that the majority of known hypertensive patients fail to achieve the recommended BP targets. It is also known that many patients require 3 or 4 different medications (6) in order to achieve target BP levels; however, many patients who are not at target BP levels continue to use only 1 or 2 medications.

The purpose of this chart abstraction research project was to answer several questions:

1. What is the prevalence of prehypertension in the adult population 30 to 80 years of age at the Family Practice Unit (FPU) at Memorial University of Newfoundland in St John's?
2. How does the prevalence of prehypertension differ by age and sex?
3. What proportion of the audited population has a diagnosis of hypertension recorded on the chart?
4. What proportion of patients with hypertension had a BP level of < 140/90 mm Hg the last time their BP measurements were recorded on their charts?
5. How many antihypertensive medications are patients with hypertension taking? □

## METHODS

The FPU at the Health Science Centre in St John's, Nfld, is an academic teaching unit in the Discipline of Family Medicine. As with most teaching family practices located in a university setting, the FPU patient population is likely skewed toward higher levels of education and greater socioeconomic status. Using the billing database, we identified 3112 registered patients between the ages of 30 and 80 years; 1879 (60.4%) had been seen within the previous 2 years. Of those who had been seen, 1388 (73.9%) had at least 1 BP measurement recorded on their charts; these 1388 adults aged 30 to 80 years who had been in for at least 1 visit within the previous 2 years (up to December 2006) and who had at least 1 BP measurement recorded on their paper charts were used as our study sample.

The charts of these 1388 patients were reviewed by trained master's-level research assistants to identify and abstract the following information: chart number, age, sex, number of BP measurements recorded in the past 2 years, last BP measurement recorded, date of last

recorded BP measurement, highest recorded BP measurement, lowest recorded BP measurement, whether or not the patient had a diagnosis of hypertension recorded on the chart, the number of BP medications prescribed to the patient, and classes of BP medications (angiotensin-converting enzyme inhibitors,  $\beta$ -blockers, calcium channel blockers, thiazide diuretics, or angiotensin receptor blockers) prescribed to the patient. The cumulative patient profile, progress notes, consultant's letters, and hospital discharge summaries were reviewed to abstract these data.

We did not assess interrater reliability, but the chart abstracters were all trained by the same family physician familiar with the chart structure; and periodic review of the abstracted data was conducted.

The study was given ethics approval by the Human Investigation Committee at Memorial University. □

**RESULTS**

Of the 1388 patients in the study population, 847 (61%) were female and 548 (39%) were male. The average patient age was 54 years (standard deviation 13 years). For purposes of analysis, we divided the patient population into those with a diagnosis of hypertension recorded in their chart (n = 389) and those without a diagnosis of hypertension recorded (n = 999). Details of these 2 groups can be found in Tables 1 and 2. Assessment of the prevalence of prehypertension was based on those without a diagnosis of hypertension.

**Table 1. Blood pressure (BP) levels in patients without a diagnosis of hypertension recorded on their charts: N = 999.**

Chart Recordings	No. of Patients (%)
No. of BP measurements in the past 2 y	
• 1	344 (34.4)
• 2 to 5	521 (52.2)
• 6 or more	134 (13.4)
Systolic BP	
• Normal (< 130 mm Hg)	648 (64.9)
• Prehypertension (130 to 139 mm Hg)	230 (23)
• Hypertension ( $\geq$ 140 mm Hg)	121 (12.1)
Diastolic BP	
• Normal (< 85 mm Hg)	808 (80.9)
• Prehypertension (85 to 89 mm Hg)	121 (12.1)
• Hypertension ( $\geq$ 90 mm Hg)	70 (7)
Any prehypertension (either 130 to 139 mm Hg systolic or 85 to 89 mm Hg diastolic)	306 (30.6)

**Table 2. Details of patients with a diagnosis of hypertension recorded on their charts: N = 389.**

Chart Recordings	No. of Patients (%)
No. of BP measurements in the past 2 y	
• 0	1 (0.1)
• 1	17 (4.4)
• 2 to 5	148 (38.1)
• 6 or more	223 (57.4)
Achievement of target	
• Systolic at target (<140 mm Hg)	271 (69.7)
• Diastolic at target (< 90 mm Hg)	341 (87.7)
• Both at target	254 (65.3)
No. of BP medications	
• 0	63 (16.2)
• 1	202 (51.9)
• 2	107 (27.5)
• 3 or more	17 (4.4)
Type of BP medications	
• Thiazides	137 (35.2)
• ACEI	188 (48.3)
• ARB	35 (9)
• BB	76 (19.5)
• CCB	37 (9.5)

ACEI – angiotensin-converting enzyme inhibitor, ARB – angiotensin receptor blocker, BB –  $\beta$ -blocker, BP – blood pressure, CCB – calcium channel blocker.

**Prehypertension**

Of the 999 patients without a diagnosis of hypertension, 306 (30.6%) had a BP measurement that was in the prehypertensive range (either systolic 130 to 139 mm Hg or diastolic 85 to 89 mm Hg); therefore, based on our current understanding of the risk of various levels of BP, nearly one-third of those previously considered to have “normal” BP levels are at increased risk for CVD. Among those with prehypertensive levels of BP, 60% had systolic pressures only in the prehypertensive range, 25% had diastolic pressures only in the prehypertensive range, and 15% had both.

Using  $c^2$  analysis, we found that prehypertension was significantly more common among men (35.4%) than women (27.8%) (odds ratio [OR] 1.27, 95% CI 1.06 to 1.53,  $P = .014$ ) and more common among older patients aged 60 to 80 years (35.6%) than among their younger counterparts aged 30 to 59 years (28.8%) (OR 1.1, 95% CI 1.01 to 1.22,  $P = .041$ ). These relationships held under logistic regression, although the  $P$  value for age increased to 0.59.

**Hypertension**

Of the 1388 patients in the current study, 389 (28%) had a documented diagnosis of hypertension. Of those with hypertension, 254 (65%) were meeting both systolic and diastolic targets (BP reading of <140/90 mm Hg), as evidenced

by the most recent BP recordings on their charts. The majority of patients in this sample were using 1 or 2 drugs (79.4%). Only 4.4% were using more than 2 drugs and 16.2% were not taking any medications. No significant association was found between number of drugs and BP control.

Logistic regression analysis was used to determine the independent effects of sex, age, and the number and class of BP medications on achievement of target BP levels. Achievement of target BP was significantly associated with age; younger patients were 1.8 times more likely (OR 1.8, 95% CI 1.1 to 2.8,  $P = 0.15$ ) to meet targets (72% meeting target BP measurements) than their older counterparts (61% meeting target BP measurements). Patient sex, number of BP medications, and class of BP medication were not significantly associated with achieving target BP levels in this population. □

## DISCUSSION

This is a study of a single group practice in a single city. The results provide one picture of the situation with BP identification, treatment, and control in primary care. What does it contribute to our current knowledge?

Of patients who are not already known to have hypertension, 30% are in a higher risk category called prehypertension and a further 12% or so actually have elevated BP, which might indicate that hypertension is already present. This implies that 40% to 50% of the adult population in this practice, who are not already diagnosed with hypertension, need close surveillance to ensure that they are treated as early as possible if sustained hypertension were to develop. It is probable that hypertension will develop; in one study, (18) two-thirds of patients with prehypertension had developed hypertension within 4 years. There is some evidence in the literature that treatment of prehypertension will decrease the rate of progression to frank hypertension. (9)

In those patients with an existing diagnosis of hypertension, 65% were at target. This is higher than in many reported studies, which often claim a target achievement rate of only 20% to 40%; however, we did not collect comorbidity data and those patients with diabetes would need a lower target than the 140/90 mm Hg that was used in this study. Hence, our target achievement rate might not be as good for patients with diabetes. The ideal target achievement rate is, of course, 100% – and we are definitely far from that. There is evidence in the literature that for many hypertensive patients to achieve target BP levels they need to be taking 3 or 4 different antihypertensive

medications. (6) Only 4.4% of our hypertensive patients were taking more than 2 medications for their BP, yet at least 35% were not at target. This fits with the lack of intensive treatment of hypertension by family physicians that has also been reported elsewhere. (12-17) A final point of interest is that only 35% of our hypertensive patients used thiazides, despite the fact that they are inexpensive, effective, and have few side effects at low doses.

## Limitations

Cross-sectional studies based on abstraction of data from paper charts will always have certain limitations. Our study is based on a single clinic. While we doubt that we are different from many other practices in Canada, this must be considered when interrupting the data. One-third of patients labeled with prehypertension had only 1 BP measurement recorded on their charts in the past 2 years. It is perhaps more appropriate to label them as having a BP level in the prehypertension range than to say they truly have prehypertension, as it might not be persistent if measured several times. Legibility of written charts and having data abstracted by various reviewers, even if they did follow a consistent methodology, are also potential sources of inaccuracy.

## Conclusion

In a family practice population, we found that 30% of adult patients who do not have a diagnosis of hypertension have prehypertension (130 to 139 mm Hg systolic or 85 to 89 mm Hg diastolic). In patients known to have hypertension, 65% were at target (<140/90 mm Hg). A large proportion of the population in a family practice need close surveillance of BP levels because of the prevalence of prehypertension. Management of hypertension appears to be better than previously reported, but there remains much room for improvement. Family physicians could be treating their hypertensive patients more aggressively with medications; only 4.4% of patients were using more than 2 different antihypertensive medications, despite 35% not being at target BP levels. Hypertension surveillance and treatment to achieve target BP levels continue to be important issues in primary care. □

### EDITOR'S KEY POINTS

- The Seventh Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure report, released in 2003, included the addition of a new blood

pressure (BP) category called *prehypertension* (systolic BP of 120 to 139 mm Hg or diastolic BP of 80 to 89 mm Hg). Those with prehypertension are at increased risk of developing hypertension.

- In this study of a large group practice, 30% of adult patients not already known to have hypertension were in this higher risk category, and a further 12% might have already been hypertensive.
- The researchers also looked at achievement of target BP in those known to have hypertension and found that achievement of target BP was significantly associated with age; younger patients were 1.8 times more likely to meet targets than their older counterparts were.
- Only 35% of the hypertensive patients were using thiazides, despite the fact that these medications are inexpensive, effective, and have few side effects at low doses.

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#### Contributors

**Dr. Godwin** contributed to concept and design of the study, analysis and interpretation of data; and preparation of the article for submission. **Ms Pike** contributed to concept and design of the study; acquisition, analysis, and interpretation of data; and preparation of the article for submission. **Ms Kirby, Ms Jewer, and Ms Murphy** contributed to concept and design of the study; acquisition of data; and preparation of the article for submission.

#### Competing interests

None declared

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