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Research Paper

Health insurance status affects hypertension control in a hospital based internal medicine clinic

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ABSTRACT

Hypertension is a worldwide disorder that contributes significantly to morbidity, mortality, and healthcare costs in both developed and developing communities. A retrospective cohort study of hypertensive patients attending the Internal Medicine continuity clinic at Nashville General Hospital (NGH) between January and December 2007 was conducted. Given the easy access to health care at NGH and affordable Blood pressure (BP) medications, we explored the ability to achieve optimal BP control <140/90 mmHg and evaluated which factors are associated. Of the 199 subjects, 59% achieved BP goal <140/90 mmHg. The mean BP was 139/80 mmHg. Health insurance status was associated with SBP and DBP (All $P < 0.046$). Patients with health insurance had a 2.2 fold increased odds of achieving BP control compared to patients without health insurance ($P = 0.025$). Furthermore, the number of BP medications used was significantly associated with SBP and DBP (All $P < 0.003$). Patients taking more than three BP medications had a 58% reduced odds of achieving optimal BP control compared to patients taking one medication ($P = 0.039$). Ethnicity was not associated with achieving BP control. Our study revealed the number of BP medications used and health insurance status, are factors associated with achieving BP control.

1. Introduction

Hypertension is a worldwide disorder that contributes significantly to morbidity, mortality, and healthcare costs in both developed and developing communities. The prevalence of hypertension in U.S. adults in 2009 was approximately 40% and the National Health and Nutrition Examination Survey (NHANES) report has shown that this prevalence has remained unchanged during the past 10 years [1–3]. The JNC 8 guidelines recommended goal for patients with uncomplicated hypertension is an average systolic blood pressure (SBP) of less than 140 mm Hg and a diastolic blood pressure (DBP) of less than 90 mm Hg for patients less than 60 years [4]. For patients with certain co-morbid conditions that increase cardiovascular risk such as diabetes mellitus and chronic kidney disease), the goal BP is similar at less than 140/90 mm Hg [4]. However, only about half of those with hypertension have their BP controlled despite these recommendations [5].

Randomized controlled trials have convincingly shown that treatment of hypertension reduces the risk of stroke, coronary heart disease, congestive heart failure, and mortality associated with these conditions [4,6]. Despite these, about 30% of patients with hypertension are not being treated pharmacologically, and only about 55% of hypertensives have their blood pressure under control [1]. Furthermore, achievement of guideline-defined treatment goals has been shown to be useful in the assessment of the quality of care [7,8].

Although awareness and treatment of hypertension have improved in recent decades, those who have difficulties accessing health care are less likely to have their BP controlled than those who have no barriers to health care access [9,10]. In addition, awareness of hypertension is higher among those who have adequate health care access because those who have difficulties accessing healthcare may delay necessary health care screenings [11]. No previous study have evaluated the factors associated with BP control when easy access to health care is available to hypertensive patients in the US.

The Nashville General Hospital (NGH) located in the Davidson county area of the state of Tennessee, USA serves the residents of the county and attends to all patients with or without health insurance. The hospital has

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programs that provide financial assistance to uninsured patients which covers access to healthcare and purchase of medications at little or no cost to the patients. Commonly used blood pressure medications are available to patients for $4 for a 30 day supply at most retail pharmacies. The primary goal of this study is to assess the ability to achieve target blood pressure control amongst hypertensive patients attending the internal medicine clinic at NGH given the easy access to health care patients are afforded. The secondary goal of this study is to evaluate the factors associated with achieving blood pressure control in the patients attending the internal medicine clinic at NGH.

1.1. Methods

A retrospective chart review of patients attending the internal medicine clinic at NGH was carried out after appropriate approval has been received from the Meharry Medical College (medical school affiliated with NGH) Institutional Review Board (IRB). The inclusion criteria for patients include: (1) age over 18 years, (2) continuous enrollment in the internal medicine continuity clinic for more than 1 year, (3) seen in clinic between January and December of 2007, (4) seen at least twice in the clinic during the 12 months prior to data collection with documentation of blood pressure measurement, (5) diagnosis and treatment for hypertension. Patients with end stage renal disease on chronic hemodialysis were excluded. Data from the medical records of these patients were extracted and recorded on standardized data collection forms. Data extracted include patient's age, sex, ethnicity, health insurance status, number of antihypertensive medications, history of diabetes mellitus and chronic kidney disease.

Blood pressures were obtained using a digital sphygmomanometer with patient seated and arm placed at appropriate position and length. Hypertension was considered controlled if blood pressure is at target goal which is SBP of less than 140 mm Hg and a DBP of less than 90 mm Hg.

The list of BP medications used in the Internal Medicine clinic of Nashville General included calcium channel blockers, diuretics, beta blockers, angiotensin receptor blockers or angiotensin converting enzyme inhibitors which are available to patients for $4 at most retail pharmacies.

1.2. Statistical analysis

Continuous variables are presented as the mean ± standard deviation (SD for normally distributed variables and median (interquartile range) for variables that are not normally distributed. Dichotomous variables are presented as numbers and frequencies. For the primary outcome, the proportion of patients achieving pre-set BP goals was computed. To test the secondary hypothesis, univariate regression analysis was conducted to assess the association of each of the collected covariates (age, sex, ethnicity, health insurance status, the number of antihypertensive medications, a diagnosis of diabetes, and a diagnosis of chronic kidney disease) and blood pressure control as a continuous variable, and as a dichotomous variable of BP control of <140/90 mmHg. Multivariate analysis exploring the effects of covariates (as earlier stated) on BP control was conducted. Statistical analysis was conducted using the IBM Statistical Package for Social Sciences (SPSS) version 21. Graphs were produced using the Graph pad Prism software.

2. Results

2.1. Demographics

200 patients met the study criteria but one patient was excluded because the blood pressure was incorrectly documented as a four digit blood pressure measurement. Of the remaining 199 study patients, 59% were female and the patient's age ranged from 22 to 98 years old with an average of 57 ± 11 years old. The study population was mostly African American (68%) and 32% did not have any health insurance. Only 12% of the study population had chronic kidney disease stage 3 or less and 45% of the population had diabetes mellitus. (Table 1). 55% of the study population used at least two blood pressure medications.

2.2. Blood pressure control

The mean (95% CI) SBP of the entire study group was 139 mmHg (136–141) mmHg while the mean (95% CI) diastolic blood pressure was 80 mmHg (79–82) mmHg. 61% of the study population achieved optimal SBP control <140 mmHg and 82% of the study population achieved optimal DBP control <90 mmHg. Overall, 59% of the study population achieved optimal guideline directed BP goal <140/90 mmHg.

2.3. Health insurance status and blood pressure control

Health insurance status was associated with SBP control. Patients without health insurance had higher SBP [Mean (95% CI; 141 (137–146) mmHg] compared to patients with health insurance [Mean (95% CI; 137 (134–140) mmHg (P = 0.046, Fig. 1). Health insurance status was also associated with DBP. Patients without health insurance had significantly higher DBP compared to patients with health insurance [Mean (95% CI; 84 (81–88) mmHg vs 78 (76–80) mmHg; P = 0.003)]. Overall, patients with health insurance had a 2.2 fold increased odds of achieving optimal BP control less than 140/90 mmHg compared to patients without health insurance (P = 0.025).

2.4. Number of BP medications used and blood pressure control

In addition to the health insurance status of patients, the number of blood pressure medications used was significantly associated with SBP and DBP (All P < 0.003, Fig. 2). Patients taking three or more BP meds had significantly higher SBP (Mean (95% CI; 143 (137–149) mmHg) and DBP (Mean 95% CI; 82 (79–85) mmHg) compared to patients taking one BP medication [Mean SBP, 95% CI; 134 (130–138) mmHg and Mean DBP 95% CI; 76 (73–80) mmHg respectively; All P < 0.003]. Furthermore, patients taking more than three BP medications had a 58% reduced odds of achieving adequate BP control less than 140/90 mmHg compared to patients taking one medication (P = 0.039).

3. Discussion

This significant findings of this research is that providing access to hypertension patients and using blood pressure medications with an average cost of $4 for a 30 day supply achieved BP control similar to the national average. Furthermore, despite the easy access to health care provided to these patients, health insurance status and number of blood pressure medications were the factors affecting blood pressure control.

Achieving BP control can be done using inexpensive generic or branded medications with comparable results. A third of patients that attended the Internal medicine clinic at Nashville general Hospital did not have health insurance and required use of generic medications with a cost of about $4 for a 30 day supply. These generic medications were deliberately prescribed to patients who could not afford the more

Table 1
Demographics of the study population.

Demographics	
Age, yrs. mean ± SD	57 ± 11
Gender, male n (%)	81 (41)
Ethnicity, Caucasians, n (%)	58 (29)
Health Insurance status, Yes, n (%)	136 (68)
History of Chronic Kidney disease, n (%)	23 (12)
History of Diabetes Mellitus, n (%)	90 (45)
No of Blood Pressure medications >4, n (%)	35 (18)
Systolic Blood Pressure, mmHg, Mean (95% CI)	139 (136–141)
Diastolic Blood Pressure, mmHg. Mean (95% CI)	80 (79–82)

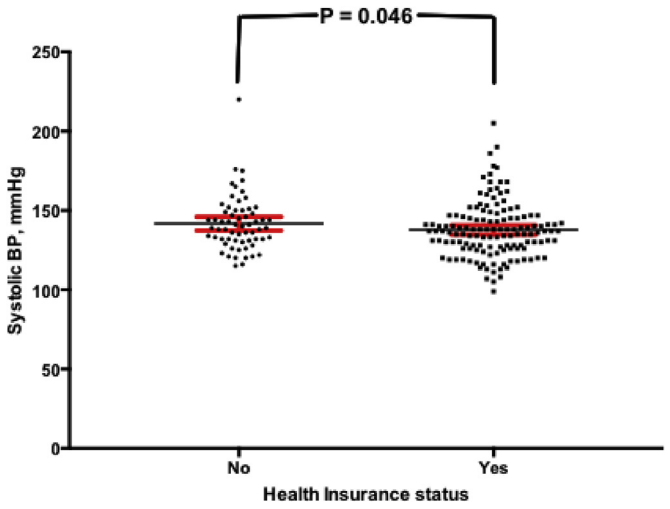

Fig. 1. Health Insurance status is associated with achieving systolic blood pressure control. Systolic blood pressures are depicted as mean (95% confidence interval).

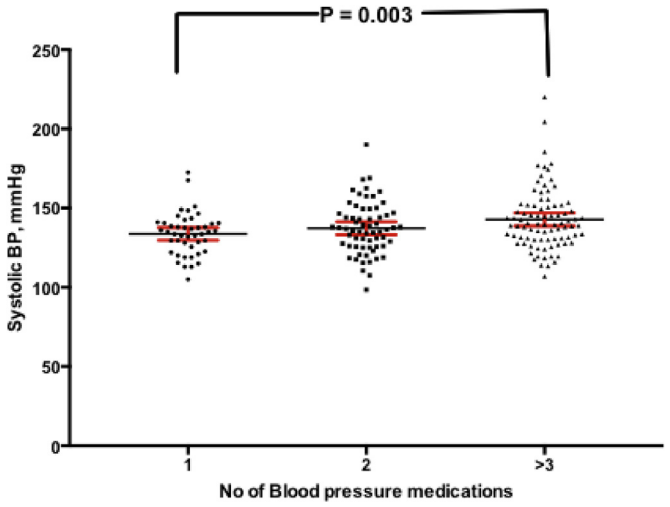

Fig. 2. The number of blood pressure medication used is associated with achieving systolic blood pressure control. Systolic blood pressures are depicted as mean (95% confidence interval).

expensive branded medications. Despite this, 59% of all the patients achieved BP control <140/90 mmHg which is similar to the 2007 national average of 50% which was when this present study population was sampled [12]. Additional factors except having easy access to their primary care physician or access to the medications prescribed are responsible for the level of BP control achieved.

Health insurance status is an indirect measure of a patient's socioeconomic status. Health insurance status is usually dependent on age, level of education, ethnicity and household income [13]. Patients that have health insurance are also more likely to access health care [9–11]. However, given that the NGH Internal medicine clinic provided easy access to all patients irrespective of their health insurance status, it was surprising that this factor continued to play a major factor affecting BP control even after removing effects of other known factors such as ethnicity, age, sex, or co-morbid clinical conditions (chronic kidney disease and diabetes mellitus). This indicates that a patient's socioeconomic status plays a major role in achieving adequate BP control. This may be due to the patient's level of education affecting their understanding of the severity of their illness and their adherence with BP medications. Although we used drugs costing about $4 to purchase a 30 day supply, this may be unaffordable to these patients as they have low household income. Further studies to explore the effect of adherence to treatment and understanding of the disease condition on BP control will be needed to confirm our findings.

Ethnicity is a well-established factor on the prevalence of hypertension, severity of hypertension, and achieving BP control as it is worse in the African American population [3]. However, our study revealed that when patients have health care access, ethnicity does not play a factor in achieving BP control. Even with 68% of our study population being African Americans, achieving optimal BP control <140/90 mmHg was not different compared to the Caucasian patients that made up 29% of the study population because everyone had access to health care. Furthermore, BP control is more suboptimal in African American patients with additional co-morbidities like chronic kidney disease and diabetes mellitus than in Caucasian patients [14–17]. However, our study revealed ethnicity is not a factor in achieving optimal BP control in these patients with co-morbidities when access to health care and affordable BP medications are provided.

The number of BP medications used by a patient is an indicator of severity of hypertension. Patients with resistant hypertension require at least three BP medications including a diuretic to achieve BP control. Although, we do not have data about baseline BP before these patients were started on BP medications, those requiring more BP medications probably had more severe hypertension at baseline. Our study revealed that the severity of BP is a factor in achieving BP control. These patients did not necessarily have more co-morbid conditions as the effects of this was adjusted for, but the severity of hypertension persistently contributed to optimal BP control. These patients may require additional BP medications and/or other BP medication combinations to achieve better BP control. A longer follow up in clinic may be needed to make these changes and achieve optimal BP control.

We do not know if findings of this present study can be extrapolated to other disease conditions like diabetes mellitus or hyperlipidemia. Additional studies in these disease conditions will be needed to test this hypothesis in a clinic setting like ours that affords easy health care access and affordable medications. Furthermore, our study was limited to a one year follow up in the clinic. A longer follow up may have revealed better BP control as patients requiring more BP medication combinations may achieve better control over time.

Our study have some limitations. We did not have a baseline BP before patients were started on medications. However, patients had to have been compliant with their clinic visits at least one year prior to enrollment into our study, and the percentage of patients achieving optimal BP control was similar to the national average. Furthermore, we had a limited study population of about 200 patients, however, the level of BP control was similar to the national average and our study population comprised mostly African Americans which is a true reflection of the ethnicity affected by the disease burden.

In conclusion, our study revealed optimal BP control can be achieved using generic affordable BP medications when easy access to health care is provided. Optimal BP control can be achieved without ethnicity or co morbid conditions like chronic kidney disease or diabetes mellitus playing a factor. However, the severity of hypertension and health insurance status may be a factor in achieving optimal BP control even when easy access to health care is provided and affordable medications are used.

Conflict of interest

The authors have no conflict of interest to disclose.

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