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Recognition of asymptomatic hypertension in an urban emergency department: where are we now?

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Abstract

Persistently elevated blood pressure (hypertension) occurs at higher rates in the emergency department (ED) (44%) than the general population (27%) and disproportionately affecting blacks and older adults. The American College of Emergency Physicians (ACEP) recommends referral to primary care for hypertension (HTN) confirmation and management when patients are asymptomatic and their blood pressure (BP) is persistently elevated (Decker, Godwin, Hess, Lenamond, & Jagoda, 2006); however, adherence to this clinical policy is suboptimal. The purpose of this study was to examine the prevalence of asymptomatic HTN; rates of blood pressure (BP) reassessment and referral, and factors associated with it among adult patients who visit the ED and who were discharged, a decade after this policy was disseminated. A retrospective chart analysis of adults with an initial BP 140/90 mmHg or greater and who were discharged were included in the sampling frame. Appropriate bivariate analysis followed by multivariate regression was conducted. There were 2,367 patients who met inclusion criteria, of which 1,184 patients had asymptomatic HTN. A greater proportion of the sample was male (51.3%), black (43.2%; $p<0.000$), middle aged (μ 50.2 ± 16), and covered by Medicaid (39.8%). Mean initial BP was 170/88 mmHg. A large proportion of patients with asymptomatic HTN (94.2%) had no previously diagnosed cardiovascular disease (CVD). BP reassessment rate was 49% (μ 158/88) and these patients were more likely to have no previously diagnosed CVDs ($p = 0.02$). Only 4.6% (n=28) of patients with asymptomatic HTN were referred and these patients were more likely to have no previously diagnosed CVDs ($p=0.000$) and be middle aged ($p=0.008$). Adherence to follow-up was 100%.

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Introduction

The Global Burden of Disease Study identified elevated blood pressure (BP; systolic BP 140 mmHg or greater and/or diastolic BP 90 mmHg or greater) as the leading risk factor for death and disability-adjusted life-years lost during 2010 (SPRINT Research Group, 2015). Persistently elevated BP [hypertension (HTN)] contributes more than any other factor to racial differences in cardiovascular disease (CVD) survival and thus, patients with HTN are at disproportionate risk for stroke, congestive heart failure, renal failure, and even death over time (Levy, Ye, Compton, Zalenski, Byrnes, Flack, & Welch, 2012). Despite the magnitude of HTN-associated morbidity and mortality and the $73.4 billion in direct and indirect annual costs to the health care system, HTN remains under diagnosed, poorly controlled, and under- or untreated in many patients (Chobanian, Bakris, & Black, Cushman, Green, Izzo, et al., 2003). The lack of attention to HTN is difficult to understand and thus, it was recently labeled a “neglected disease” by the Institute of Medicine (2010).

Patients with HTN are disproportionately represented in the ED (Lewin, 2007; Bauman, Abate, Cowan, Chansky, Rosa, Boudreaux, et al., 2007; Niska, 2011). Depending on the community in which the ED resides, many of these patients are without a usual source of care, (Niska, 2011; Bauman et al., 2007) are uninsured or on Medicaid (Niska, 2011; Karras, Ufberg, Heilpern, & Cienki, 2005); have a lower education level (Bauman et al, 2007; Karras et al., 2005; Niska, 2011); have an income less than $25,000 annually (Karras et al., 2005; Rhodes, Lauderdale, Stocking, Howes, Roizen, & Levinson, 2011); are a minority or immigrant (Bauman et al, 2007; Karras et al., 2005; Rhodes et al., 2001); or elderly (Bauman et al, 2007; Karras et al., 2005). These same individuals suffer the highest rates of morbidity and mortality related to cardiovascular diseases (Niska, 2011).

Nearly 44% of patients who visit the ED have elevated BP, compared to 27% of patients visiting their primary care provider (PCP; Niska, 2011). Since elevated BP rarely produces clinical symptoms, patients with undiagnosed HTN or poorly controlled HTN are often asymptomatic when they present to the ED (Decker et al., 2006). The American College of Emergency Physicians (ACEP) does not recommend routine testing or immediate treatment for these patients; however, *BP reassessment and referral* for all adults in which their BP is *persistently* elevated (140/90 mmHg or higher) is recommended (Decker et al., 2006). This is based on the guidelines of the *Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure* (JNC-7 Report) (Chobanian, et al., 2003; Decker et al., 2006); and the evidence that demonstrates elevated BP is not only prevalent in the ED, but remains persistently abnormal after the ED visit (Decker et al., 2006). As many as two-thirds of ED patients have been found to remain hypertensive in an outpatient setting, contrary to the beliefs of many, (Backer, Decker, & Ackerson, 2003; Chobanian, 2003; Fleming & Henry, 2004; Karras, Ufberg, Heilpern, K. & Cienki, 2005; Tanabe, Persell, Adams, McCormick, Martinovich, & Baker, 2008; Tilman, DeLashaw, Lowe, Springer, Hundley, & Counselman, 2006; Souffront et al, 2016), with higher rates of sustained BP among blacks and the elderly (Karras et al, 2007; Fleming et al, 2004; Niska, 2011; Tanabe et al., 2008; Jones, Appel, Sheps, Rocella, & Lenfant, 2003).

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Unfortunately, implementing this clinical policy has been problematic (Soufront et al., 2015), with studies showing that only 7%–25% of patients are actually referred, even a decade after dissemination of the ACEP Policy (Bauman, Cline, Cienki, Egging, Lehrmann, & Tanabe, 2009; Bauman, Abate, Cowan, Chansky, Rosa, & Boudreaux, 2007; Lehrman, Tanabe, Baumann, Jones, Martinovich, & Adams, 2007; Bauman, Clinie, & Pimenta, 2011). To understand why referrals are not made, barriers and facilitators to referral have been studied (Souffront, Chyun, & Kovner, 2015; Souffront, Chyun, Kovner, & Ogedegbe, 2016; Tanabe, Cline, Cienki, Egging, Lehrmann, & Baumann, 2011). Some self-reported provider barriers include knowledge, attitudes, and organizational factors, such as lack of time (Souffront et al., 2015; Souffront et al., 2016; Tanabe et al., 2008), and these self-reported barriers may be used as a basis for implementing an intervention to improve referral rates. However, prior to implementing an intervention, we wanted to gain a better understanding of current reassessment/referral rates at our facility. Therefore, the primary aim for this study was to examine the prevalence of asymptomatic HTN, BP reassessment and referral, and factors associated with it in our urban academic medical center, a decade after the ACEP clinical policy was disseminated.

Methods

Study Design

Following an exempt determination by the Institutional Review Board, a retrospective review for all ED encounters was performed over two weeks in each calendar quarter (September, January, April, and July) for the study period 2014–2015. All patients whose initial systolic blood pressure (SBP) was 140 mmHg or higher and/or diastolic blood pressure (DBP) 90 mmHg or higher and who were discharged from the ED were included in the sampling frame.

Sample and Setting

Two EDs participated in this investigation; both urban academic centers in New York City with an annual census of over 100, 000 and 50,000, respectively. Both EDs combined serve a diverse population based on race/ethnicity, age, and income.

Data Collection

Demographic data obtained for the retrospective chart review included initial and second BP level, triage category, age, gender, race/ethnicity, insurance status, chief complaint, pain level, and practice patterns (reassessment and referral). The BP ranges provided by JNC 7 (2004) for pre-hypertension (systolic BP 120–139 mmHg or diastolic BP 80–89 mmHg); stage one HTN (systolic BP 140–159 or diastolic BP 90–99 mmHg), and stage two HTN (systolic BP or higher 160 mmHg or diastolic BP 100 mmHg or higher) were used for BP staging in order to facilitate presentation of the data.

Any repeated BP measurement constituted a BP reassessment. To qualify as a referral, discharge instructions had to specifically state follow up for elevated BP was recommended. Hospital data were extracted for past medical conditions which included myocardial infarction, HTN, diabetes, myocardial infarction, and coronary heart disease, because these

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marker conditions may be facilitators to adherence toward the JNC 7 and ACEP guidelines. Patients with chest pain, shortness of breath, and neurologic complaints were considered symptomatic and were not included in the analysis. A neurologic complaint was defined a priori as focal weakness, visual changes, headache, sensory changes, or disequilibrium. Asymptomatic HTN was defined as the absence of these symptoms. For patients who followed up at our facility, we electronically extracted if and when a patient returned for a subsequent encounter.

Data were extracted from an existing clinical database (EPIC®) such that a query was requested and de-identified data were electronically received from the electronic health record in a password protected Excel file. Data were transferred to SPSS (Version 22.0). Charts were reviewed and data were abstracted by trained research staff and then coded for analysis.

Data Analysis

Descriptive statistics were calculated and are presented in percentages or means. Bivariate analyses were conducted using independent *t* tests or analysis of variance and chi-square tests to test for significant relationships between the independent variables and the dependent variable (referral and reassessment). Variables with a $p < 0.10$ in the bivariate analyses were selected for backward entry into a multivariate logistic regression model. This level of significance was chosen to capture predictor variables that may be only trending toward significance in the bivariate analysis but may be significant predictors or confounders in the multivariate logistic regression when controlling for additional factors. Variables with the largest *p*-value were removed first. However, any variable that resulted in a Log Likelihood change of greater than 3.84 after the item was removed, was returned to the model. Any variable that significantly improved the fit of the model was retained.

Results

A total of 2,367 patients met inclusion criteria of which 49% (N=1184) had asymptomatic HTN. As shown in Table 1, a greater proportion of patients with asymptomatic HTN were male (52.2%), black (41.4%; $p = 0.000$), middle aged (μ 50.2 ± 16), had Medicaid (39.8%; $p = 0.000$), and presented for a non-urgent complaint (Emergency Severity Index [ESI 3]; 60%; $p < 0.05$). As shown in Table 2, a large proportion of patients with asymptomatic HTN had some pain (72.3%) and had no previously documented CVD (94.8%), and only 2% were previously diagnosed with HTN.

For the outcome variable reassessment, 49% had their BP reassessed. Thirty percent of these patients' second BP reading was 140/90 mmHg or lower. Mean reassessed BP was 158/88 mmHg with a greater proportion of patients having an abnormal Stage I (27.6%) or Stage II SBP (24.6%). As shown in Table 2, patients who had a BP reassessment were more likely to have no previously documented CVD (OR 1.09; CI 1.01–1.18).

For the outcome variable referral, only 4.6% (n= 28) of patients had asymptomatic HTN and were referred according to the ACEP guideline. An exploratory multivariate regression analysis found that those who presented with no previously documented CVD (OR 1.57; CI

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1.02–1.79; $p = 0.002$) and those who were middle aged (OR 2.0; CI 1.2–3.3; $p=0.000$) were referred. Of the patients who were referred, 100% (n = 28) were patients who sought primary care at our facility and adhered to the ED provider recommendations for follow-up; the majority of the patients having a subsequent encounter with a provider at our facility at two weeks or more (67.9%).

Discussion

Among the reasons that ED clinicians are missing the opportunity to play a significant role in the care of ED patients with elevated BP is a pervasive, but mistaken, belief that elevated BPs in the ED do not represent real disease (Tanabe, Steinmann, Kippenhan, Stehman, & Beach, 2004). Various studies have refuted the belief that elevated BP in the ED is related to pain or anxiety (Tanabe et al., 2004). Early studies showed that, among patients with elevated BP who were followed post-ED, 68%–73% of patients had HTN beyond the ED visit (Backer, Decker, & Ackerson, 2003; Fleming & Henry, 2004). Tanabe et al. (2004) found that 7% of such patients were normotensive 2 weeks after an ED visit; 41% had pre-HTN (as defined by JNC7); 8% had Stage I and 17% had Stage II HTN; there was no association between ED pain scores or anxiety scores and differences between ED and at-home BP. These data underscore the importance of the ED as a point to identify patients at risk for HTN and potential hypertensive related target organ consequences.

The ED is a busy environment where priority is given to the most critically ill and injured. However, ED patients increasingly have multiple chronic illnesses that may not be the proximate cause of the ED visit but that may benefit from intervention during the ED visit. ED providers are often in a unique position to screen for serious conditions, provide preventive interventions, and offer care coordination services that may challenge traditional views of the ED practice. These new paradigms are redefining optimal ED care and will benefit our patients in ways that are more meaningful and impactful than simply addressing the acute problem alone. Our study is similar to previous studies in that only a small percentage of ED patients with persistent asymptomatic elevated BP were referred for follow up. Even after a decade since the ACEP Policy was disseminated (2006), rates of referral remain low. Studies to date show referral for persistent elevated BP to be less than 10% (Lehrman et al., 2007; Bauman et al., 2009).

Patients are more likely to be referred for further evaluation in cases where BP is severely elevated, when patients have symptoms of HTN, or when there are underlying co-morbid conditions (Bauman et al., 2003; Tanabe et al., 2004). Patients in the ED who do not have an underlying condition but may have moderately elevated BP (JNC-7 stage 1 [140–159/90–99 mm Hg]) are less frequently referred for BP re-evaluation, even though these patients are at increased risk for adverse hypertensive events (Niska, 2011). Patients who have a BP in the range of 130–139/80–89 mm Hg have a more than two-fold relative risk for developing CVDs compared with those that have BP levels lower than 120/80 mm Hg (Chobanian et al., 2003)Our findings, however, were not similar, but this is likely due to small sample size (N=28) of patients who were referred.

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We found that patients who were referred were more likely to have no previously diagnosed CVD. One explanation may be that ED clinicians interpret an elevated BP in a patient who has *diagnosed* HTN as less of a priority to recommend a referral in an inherently busy environment, since he/she may be more likely to have a primary care provider if he/she was previously diagnosed. However, given the significant impact an ED clinican may have on the health of a patient who has uncontrolled HTN, providing a referral is critical and will help reduce the development of adverse effects of having uncontrolled HTN. In a study by Levy et al. (2012), an overwhelming majority (90%) of predominately black patients who had asymptomatic HTN in an urban ED were found to have subclinical heart disease, the majority being left ventricular hypertrophy (Levy, Compton, Zalenski, Byrnes, Flack, & Welch, 2012).

Hypertension is simple to diagnose and treat, yet often poorly controlled. As a result HTN has been recently labeled a “neglected disease” by the IOM (2010). A current research agenda recommended by the IOM is to promote policy and system change approaches to get patients who should be in treatment and receive care that is consistent with current treatment guidelines (2010). Improving BP reassessment and referral for asymptomatic HTN is one way to address this research agenda.

Limitations and Conclusion

Each ED has inherent system strengths and weaknesses and this was a retrospective review of only two urban EDs that have a similar patient population. Furthermore, this chart review did not capture other factors that may have contributed to reassessment/referral rates. Interventions aimed to improve referral rates are critical. Emergency department clinicians may have the potential to reduce the detrimental effects caused by having undiagnosed or poorly controlled HTN by acknowledging that BP is high and recommending referral for BP followed-up, while appreciating existing patient and system-wide barriers. This is promising because 100% of our patients adhered to follow up recommendation; however, the fact that such a small number were actually referred makes this number non-generalizable.

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Table 1

Demographic characteristics of sample

Demographic Variables	N (%)
Gender (n (%)	
Male	607 (51.4%)
Female	576 (48.6%)
Race/Ethnicity n (%)	
Black *	511 (58.6%)
White	183 (15.5%)
Hispanic/Latino	5 (0.4%)
Other	420 (35.5%)
Pacific Islander	1 (0.1%)
Unknown	39 (3.3%)
Age, *M* (SD)	50.2 ± 16
18–24	63 (5.3%)
24–44	355 (30%)
45–64	544 (45.9%)
65–74	131 (11.1%)
75+	91 (7.7%)
Insurance Status n (%)	
Medicaid *	471 (39.8%)
Private	302 (25.5%)
Medicare	254 (21.5%)
Self-Pay	142 (12%)
Other	15 (1.2%)

* P =0.000

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Table 2

Description of patient characteristics of those with asymptomatic HTN

Patient Characteristic	**1,184 (50%)**
Triage Category (ESI)	
ESI 2	94 (10.5%)
ESI 3 *	538 (60.0)%)
ESI 4	250 (27.8%)
ESI5	15 (1.7%)
PMH	
CVD	62 (5.2%)
NO CVD	1,122 (94.8%)
Pain n (%) (*M*)	*M* 7/10 pain
Yes	830 (72.3%)
No or not measured	354(27.7%)
Initial BP *M*	μ 170/98
Stage I SBP	470 (39.7%)
Stage II SBP	714(60.3%)
Stage I DBP	811 (68.5%)
Stage II DBP	373 (31.5%)
Reassessment n (%); *M* (SD)	591 (49.9%); μ 158/88 +
Normal SBP	182 (30.8%)
Stage I SBP	163 (27.6%)
Stage II SBP	246(41.6%)
Normal DBP	351 (59.3%)
Stage I DBP	140 (23.6%)
Stage II DBP	101 (17.1%)
Referred N (%)	28 (4.6%)
2 weeks or less	9 (32.1%)
greater than 2 weeks	19 (67.9%)

* < 0.05;

ESI – Emergency Severity Index; CVD, cardiovascular Disease; *M*, mean; %, percentage; BP, blood pressure; SBP, systolic blood pressure; DBP, diastolic blood pressure;

+ 2 missing data cases

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Table 3

Forward Entry Step-wise Multiple Regression – Factors associated with BP reassessment for those with Asymptomatic HTN

	OR (95% CI)	P
Age 45–64	1.25 (1.01–1.55)	0.040
No previous CVD	1.09 (1.01–1.18)	0.032

BP, blood pressure; HTN, hypertension; OR, Odds Ratio; CI, confidence interval; P, Significance value; CVD, cardiovascular disease

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Table 4

Forward Entry Step-wise Multiple Regression - Factors associated with referral for those with HTN

	OR (95% CI)	P
DBP ≥ 90 mmHg	1.4 (.07–.57)	0.034
No previous CVD	1.57 (1.02–1.79)	0.002

HTN, hypertension; OR, odds ratio CI, confidence interval; P, significance value; DBP, diastolic blood pressure; CVD, cardiovascular disease