Original Investigation

Characteristics and Outcomes of Patients Presenting With Hypertensive Urgency in the Office Setting

Krishna K. Patel, MD; Laura Young, MD; Erik H. Howell, MD; Bo Hu, PhD; Gregory Rutecki, MD; George Thomas, MD; Michael B. Rothberg, MD, MPH

IMPORTANCE The prevalence and short-term outcomes of hypertensive urgency (systolic blood pressure ≥180 mm Hg and/or diastolic blood pressure ≥110 mm Hg) are unknown. Guidelines recommend achieving blood pressure control within 24 to 48 hours. However, some patients are referred to the emergency department (ED) or directly admitted to the hospital, and whether hospital management is associated with better outcomes is unknown.

OBJECTIVES To describe the prevalence of hypertensive urgency and the characteristics and short-term outcomes of these patients, and to determine whether referral to the hospital is associated with better outcomes than outpatient management.

DESIGN, SETTING, AND PARTICIPANTS This retrospective cohort study with propensity matching included all patients presenting with hypertensive urgency to an office in the Cleveland Clinic Healthcare system from January 1, 2008, to December 31, 2013. Pregnant women and patients referred to the hospital for symptoms or treatment of other conditions were excluded. Final follow-up was completed on June 30, 2014, and data were assessed from October 31, 2014, to May 31, 2015.

EXPOSURES Hospital vs ambulatory blood pressure management.

MAIN OUTCOMES AND MEASURES Major adverse cardiovascular events (MACE) consisting of acute coronary syndrome and stroke or transient ischemic attack, uncontrolled hypertension (≥140/90 mm Hg), and hospital admissions.

RESULTS Of 2 199 019 unique patient office visits, 59 836 (4.6%) met the definition of hypertensive urgency. After excluding 851 patients, 58 535 were included. Mean (SD) age was 63.1 (15.4) years; 57.7% were women; and 76.0% were white. Mean (SD) body mass index (calculated as weight in kilograms divided by height in meters squared) was 31.1 (7.6); mean (SD) systolic blood pressure, 182.5 (16.6) mm Hg; and mean (SD) diastolic blood pressure, 96.4 (15.8) mm Hg. In the propensity-matched analysis, the 852 patients sent home were compared with the 426 patients referred to the hospital, with no significant difference in MACE at 7 days (0 vs 2 [0.5%]; $P = .11$), 8 to 30 days (0 vs 2 [0.5%]; $P = .11$), or 6 months (8 [0.9%] vs 4 [0.9%]; $P > .99$). Patients sent home were more likely to have uncontrolled hypertension at 1 month (735 of 852 [86.3%] vs 349 of 426 [81.9%]; $P = .04$) but not at 6 months (393 of 608 [64.6%] vs 213 of 320 [66.6%]; $P = .56$). Patients sent home had lower hospital admission rates at 7 days (40 [4.7%] vs 35 [8.2%]; $P = .01$) and at 8 to 30 days (59 [6.9%] vs 48 [11.3%]; $P = .009$).

CONCLUSIONS AND RELEVANCE Hypertensive urgency is common, but the rate of MACE in asymptomatic patients is very low. Visits to the ED were associated with more hospitalizations, but not improved outcomes. Most patients still had uncontrolled hypertension 6 months later.

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Author Affiliations: Department of Internal Medicine, Medicine Institute, Cleveland Clinic Foundation, Cleveland, Ohio (Patel, Young, Howell, Rutecki, Rothberg); Department of Cardiology, University of Rochester, Rochester, New York (Howell); Department of Quantitative Health Sciences, Cleveland Clinic Foundation, Cleveland, Ohio (Hu); Department of Nephrology, Cleveland Clinic Foundation, Cleveland, Ohio (Thomas).

Corresponding Author: Krishna K. Patel, MD, Department of Internal Medicine, Medicine Institute, Cleveland Clinic Foundation, 9500 Euclid Ave, Desk G10-C, Cleveland, OH 44195 (patelk11@ccf.org).

Approximately one-third of the US population has hypertension, which is associated with an increased risk for end-organ damage, mainly myocardial infarction, heart failure, stroke, and kidney damage.[1-4] For chronic uncontrolled hypertension, every 20-mm Hg increase in systolic blood pressure (SBP) or 10-mm Hg increase in diastolic blood pressure (DPB) is associated with doubling of vascular mortality.[5] Because organ damage results from increased blood pressure over time, physicians may be concerned about the potential for end-organ damage after severely elevated blood pressure, even for short periods. Hypertensive urgency is defined as SBP of at least 180 mm Hg and/or DBP of at least 110 mm Hg, without associated end-organ damage.[6-8] The prevalence of hypertensive urgency in the outpatient setting is unknown, and management is complicated by a lack of observational studies or randomized clinical trials. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommended gradual blood pressure control for 24 to 48 hours,[4] but this was not addressed in the eighth report.[9]

Many patients with hypertensive urgency undergo evaluation and treatment in the emergency department (ED), where asymptomatic severe hypertension accounts for as many as 27% of medical emergencies[10] and 3% of all visits.[10,11] A recent American College of Emergency Physicians policy statement on this topic acknowledges the dearth of evidence supporting recommendations for optimal follow-up, checking for target organ damage, and the effectiveness of ED treatment.[12] In practice, when patients present to outpatient clinics with severely elevated blood pressure, some are directly admitted to the hospital, some are sent to the ED, and others are sent home with adjustments to antihypertensive therapy. To our knowledge, no retrospective or prospective studies exist to inform management.

To address these concerns, we conducted a retrospective cohort study of all patients presenting with hypertensive urgency in an office setting within a single health care system during a 6-year period. We hypothesized that ambulatory patients with hypertensive urgency would have low rates of cardiovascular events in the short term and that referral to the hospital would not improve outcomes.

Key Points

Question For ambulatory patients presenting with hypertensive urgency, is referral to the hospital safer than routine outpatient management of blood pressure?

Findings In this retrospective study of 58 535 patients, emergency department visits for hypertensive urgency were associated with an 8.2% rate of hospital admissions at 7 days vs 4.7% for patients sent home, a significant difference. Major cardiac events were rare, and two-thirds of patients still had uncontrolled hypertension at 6 months.

Meaning For patients presenting with asymptomatic hypertensive urgency, efforts should focus on improving follow-up and serial blood pressure control instead of referral to the hospital.

Methods

We conducted a retrospective cohort study of all patients presenting with hypertensive urgency to an outpatient office within the Cleveland Clinic Healthcare System from January 1, 2008, to December 31, 2013. The Cleveland Clinic Healthcare System includes outpatient practices in all specialties, consisting of 1 large academic health care center, 10 regional hospitals, 17 family health centers, and more than 75 outpatient locations in northeast Ohio and Florida. This study was approved by the institutional review board of the Cleveland Clinic Healthcare System. Owing to the retrospective nature of the study, informed consent was waived by the institutional review board.

We defined hypertensive urgency as SBP of at least 180 mm Hg and/or DBP of at least 110 mm Hg.[4] We excluded pregnant women and patients referred to the hospital for symptoms or for treatment of conditions other than hypertension. Patients were divided between those sent home from the office and those referred to the hospital (ED or direct inpatient admission) on the same day. To estimate the prevalence, we divided the number of visits for hypertensive urgency by the total number of unique patient visits to outpatient offices of the Cleveland Clinic Healthcare System during the study period. For patients with multiple visits with hypertensive urgency, only the first visit was included.

Baseline Characteristics

For each patient, we recorded baseline demographic data, including age, sex, race, blood pressure, and body mass index (calculated as weight in kilograms divided by height in meters squared). We recorded history of atherosclerotic risk factors, including hypertension, diabetes, smoking, coronary artery disease, hyperlipidemia, chronic kidney disease, dialysis, and cerebrovascular events, based on encounter diagnosis codes before the index visit. We also recorded antihypertensives used at the index visit. Data were generated electronically and validated with 100% accuracy through manual medical record review.

End Point

All patients were followed up for 6 months and all blood pressure readings were recorded. Patients were considered to have uncontrolled hypertension at 1 month or 6 months if the last blood pressure reading in that period was at least 140/90 mm Hg.[1,13] We reviewed all subsequent visits in our health care system and recorded major adverse cardiovascular events (MACE) within 7 days, 1 month, and 6 months of the index visit. MACE included acute coronary syndrome and cerebrovascular events. All outcomes were identified electronically via codes from the *International Classification of Diseases, Ninth Revision*, and then manually adjudicated through medical record review by 2 independent reviewers (K.K.P. and L.Y.). Acute coronary syndromes (ST and non-ST elevation myocardial infarction and unstable angina) had to have been diagnosed in the medical record by the consulting

cardiologist. Similarly, cerebrovascular events (ischemic and hemorrhagic strokes or transient ischemic attacks with attributable territory of origin) had to have been diagnosed by a consulting neurologist. On review, fewer than 10% of the codes represented a new event. We also recorded all-cause hospital admission rates, including ED, observation, and inpatient admissions within 7 days of the baseline visit and from 8 to 30 days (1 month) after to assess for changes in the use of health care resources between the 2 treatment groups. Patients who did not have a subsequent blood pressure reading were considered lost to or unavailable for follow-up and were not included in the analysis of blood pressure control. For patients who were referred to the ED solely for treatment of blood pressure, details of management, including tests and results, were recorded by manual medical record review. Target organ damage was identified by test results.

Statistical Analysis

Patient characteristics were summarized with descriptive statistics. Continuous variables were compared using the unpaired *t* test and categorical variables were compared using the χ^2 test. We created a propensity model with referral to the ED or hospital as the outcome. The model included baseline demographics (age, sex, and race), SBP and DBP values, vascular disease risk factors (hypertension, diabetes, hyperlipidemia, stroke or transient ischemic attack, chronic kidney disease, dialysis, and coronary artery disease), and number of antihypertensives used at baseline. Asymptomatic patients referred to the ED or hospital were then matched with patients sent home in a 1:2 ratio using the propensity-matching algorithm in R software.[14] We compared outcomes between patients referred to the ED or hospital and propensity-matched control individuals using Pearson χ^2 test or Fisher exact test if the events were rare.[15-17] Baseline characteristics of patients lost to or unavailable for follow-up were compared with those of patients who had follow- up. We then performed a sensitivity analysis in which we limited the data set to patients who had a primary care physician in our health care system and limited the analysis to those patients who had a blood pressure reading within 6 months. We also performed stratified analyses limited to patients with SBPs of at least 200 and at least 220 mm Hg. All analyses were conducted with R studio software (https://www.r-project.org/). Statistical significance was established at a 2-sided $P < .05$.

Results

During the study period, 1 299 019 unique patient office visits occurred during which a blood pressure reading was recorded, and 59 836 of these (4.6%) met the definition for hypertensive urgency. After excluding 851 patients (eFigure in the Supplement), our final sample included 58 535 patients. Characteristics of the population appear in **Table 1**. Patients had a mean (SD) age of 63.1 (15.4) years; 57.7% were women; and 76.0% were white. The mean (SD) body mass index was 31.1 (7.6). The mean (SD) SBP was 182.5 (16.6) mm Hg, with 10.2% of the patients having an SBP of at least 200 mm Hg. The mean (SD) DBP was 96.4 (15.8) mm Hg with 5.7% of the patients having a DBP of at least 120 mm Hg. We found a documented history of hypertension in 72.9% of patients, and 58.2% of patients were taking 2 or more antihypertensives.

Only 426 patients (0.7%) were referred to the hospital for blood pressure management. The rest (n = 58 109) were sent home. The mean blood pressure of patients referred to the hospital for management was 16/11 mm Hg higher than that of patients sent home ($P < .001$). Of the 426 patients who were referred to the hospital, 218 (51.2%) had an SBP of at least 200 mm Hg compared with 5745 (9.9%) of 58 109 patients sent home ($P < .001$). The distribution of most atherosclerotic risk factors was similar between groups, but patients sent to the hospital were more likely to have a history of hypertension (408 of 424 [96.2%] vs 42 264 of 57 916 [73.0%]; $P < .001$) and chronic kidney disease (71 of 426 [16.7%] vs 6050 of 58 109 [10.4%]; $P < .01$). The number and type of antihypertensives taken for both groups are shown in Table 1.

Table 2 shows the unadjusted outcomes for all patients. Overall, the rate of MACE within 7 days, 8 to 30 days (1 month), and 6 months was low (<1%) in both groups. A total of 496 patients experienced MACE within 6 months (205 episodes of acute coronary syndrome and 301 episodes of stroke or transient ischemic attack). Regardless of where patients were treated, the percentage of patients with controlled hypertension at 1 and 6 months was poor. In unadjusted analyses compared with patients sent home, patients referred to the hospital had more MACE at 7 days (2 of 426 [0.5%] vs 61 of 58 109 [0.1%]; $P = .02$) but no significant difference at 1 and 6 months. They also had a higher 7-day (35 of 426 [8.2%] vs 2311 of 58 109 [4.0%]; $P < .001$) and 8- to 30-day (48 of 426 [11.3%] vs 3897 of 58 109 [6.7%]; $P < .001$) hospital admission rates.

Our propensity model had a C statistic of 0.83. For our propensity-matched analysis, we were able to match all 426 patients referred to the hospital in a 1:2 ratio with patients sent home (**Table 3**). The baseline characteristics of the matched groups appear in eTable 1 in the Supplement. In the propensity-matched analysis, patients sent home (n = 852) compared with patients referred to the hospital (n = 426) had no significant difference in MACE at 7 days (0 vs 2 [0.5%]; $P = .11$]), 8 to 30 days (0 vs 2 [0.5%]; $P = .11$), or 6 months (8 [0.9%] vs 4 [0.9%]; $P > .99$). Patients sent home were more likely to have uncontrolled hypertension at 1 month (735 [86.3%] vs 349 [81.9%]; $P = .04$) but not at 6 months (393 of 608 [64.6%] vs 213 of 320 [66.6%]; $P = .56$). They also had lower hospital admission rates at 7 days (40 [4.7%] vs 35 [8.2%]; $P = .01$) and 8 to 30 days (59 [6.9%] vs 48 [11.3%]; $P = .009$).

Loss to or unavailability for follow-up occurred in 58 of the 426 patients referred to the hospital (13.6%) and 12 553 of the 58 109 patients sent home (21.6%). Baseline characteristics of patients with and without follow-up did not differ significantly (eTable 2 in the Supplement). Limiting the analysis to patients with follow-up at 6 months did not change the results (eTable 3 in the Supplement). Patients who had a primary care physician in the Cleveland Clinic Healthcare System (44.2% of our sample) were less likely to be lost to or unavailable for follow-up, including 9 of 172 (5.2%) of those

Table 1. Baseline Characteristics of Patients Presenting With Hypertensive Urgency to the Office Setting

Characteristic	Study Group		*P* Value[b]
	Referred to Hospital[a] (n = 496)	Sent Home (n = 58 109)	
Age, mean (SD), y	58.7 (16.2)	63.1 (15.4)	<.001
Female sex, No./total No. (%)	266/426 (62.4)	33 504/58 109 (57.7)	.04
Race, No./total No. (%)			
White	255/426 (59.9)	44 220/58 109 (76.1)	<.001
African American	157/426 (36.9)	11 361/58 109 (19.6)	
Other	14/426 (3.3)	2528/58 109 (4.4)	
SBP, mean (SD), mm Hg	198.4 (22.1)	182.4 (16.4)	<.001
DBP, mean (SD), mm Hg	107.4 (17.4)	96.4 (15.7)	<.001
BMI, mean (SD)	31.6 (7.7)	31.1 (7.6)	.61
Hypertension, No./total No. (%)	408/424 (96.2)	42 264/58 109 (72.7)	<.001
Diabetes, No./total No. (%)	121/426 (28.4)	14 593/58 109 (25.1)	.12
Smoking, No./total No. (%)	227/424 (53.5)	28 192/58 109 (48.5)	.046
Coronary artery disease, No./total No. (%)	76/424 (17.9)	10 906/58 109 (18.8)	.63
Hyperlipidemia, No./total No. (%)	186/426 (43.7)	26 492/58 109 (45.6)	.43
Chronic kidney disease, No./total No. (%)	71/426 (16.7)	6050/58 109 (10.4)	<.001
Stroke or TIA, No./total No. (%)	24/426 (5.6)	3411/58 109 (5.9)	.84
Taking ≥2 antihypertensives, No./total No. (%)	232/426 (54.5)	33 812/58 109 (58.2)	.12
Taking ≥3 antihypertensives, No./total No. (%)	158/426 (37.1)	21 665/58 109 (37.3)	.93
Thiazide diuretic, No. (%)	62/402 (15.4)	9751/55 945 (17.4)	.25
ACE-I/ARB, No. (%)	138/402 (34.3)	23 160/55 945 (41.4)	.002
β-Blockers, No. (%)	179/402 (44.5)	24 912/55 945 (44.5)	.76
Calcium channel blockers, No. (%)	106/402 (26.4)	14 657/55 945 (26.2)	.92
Hydralazine hydrochloride, No. (%)	27/402 (6.7)	2274/55 945 (4.1)	.01
Clonidine, No. (%)	52/402 (12.9)	3565/55 945 (6.4)	<.001
Potassium-sparing diuretics, No. (%)	29/402 (7.2)	3709/55 945 (6.6)	.80
Loop diuretic, No. (%)	66/402 (16.4)	7772/55 945 (13.9)	.23
Nitrates, No. (%)	28/402 (7.0)	4101/55 945 (7.3)	.77
No. of medications, No./total No. (%)			
0	107/402 (26.6)	11 911/55 945 (21.3)	.03
1	63/402 (15.7)	10 222/55 945 (18.3)	
2	74/402 (18.4)	12 147/55 945 (21.7)	
≥3	158/402 (39.3)	21 665/55 945 (38.7)	

Abbreviations: ACE-I, angiotensin-converting enzyme inhibitors; ARB, angiotensin receptor blockers; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); DBP, diastolic blood pressure; SBP, systolic blood pressure; TIA, transient ischemic attack.

[a] Includes emergency department visits, observation, and inpatient hospital admissions.

[b] Calculated using the unpaired *t* test used for continuous variables and Pearson χ^2 test for categorical variables (all 2-tailed).

referred to the hospital and 3036 of 22 648 (13.4%) of those sent home. Unadjusted and propensity-matched analyses of these patients (eTable 3 in the Supplement) yielded essentially the same results.

When we limited the analysis to patients with higher blood pressure values, 218 of 5963 patients with SBP of at least 200 mm Hg (3.7%) and 81 of 1058 patients with SBP of at least 220 mm Hg (7.7%) at baseline were referred to the hospital (eTables 4 to 7 in the Supplement). The referred patients were younger, were more likely to be African American, and had higher blood pressure values and more comorbidities. As in the overall sample, patients referred to the hospital had less uncontrolled hypertension at 1 month but not at 6 months. MACE outcomes and hospital admission rates did not differ significantly.

Of the 426 patients referred to the hospital, 387 were referred to the ED; the rest were directly admitted to an inpatient unit. On arrival at the ED, mean (SD) SBP was 197.1 (27.8) mm Hg and mean (SD) DBP was 103.1 (18.7) mm Hg. On discharge, mean (SD) SBP had fallen to 166.3 (23.3) mm Hg and DBP to 87.1 (15.4) mm Hg. Eight patients (1.9%) had evidence of target organ damage (4 had pulmonary edema, 2 had acute kidney injury, and 2 had elevated levels of cardiac biomarkers). The cause of hypertensive urgency was unknown in 233 patients (60.2%), attributed to nonadherence to therapy (including running out of medications) in 94 (24.3%), new diagnoses of hypertension in 42 (10.9%), and referral because they were new patients who presented with elevated blood pressure readings in 18 (4.7%). Treatment consisted of a 1-time dose of antihypertensive medication for 224 of 379 patients (59.1%)

Table 2. Unadjusted Outcomes of Patients With Hypertensive Urgency

Outcome	No. (%) of Patients		P Value[b]
	Referred to Hospital (n = 426)[a]	Sent Home (n = 58 109)	
MACE[c]			
7 d	2 (0.5)	61 (0.1)	.02
8-30 d	2 (0.5)	119 (0.2)	.23
1-6 mo	4 (0.9)	492 (0.8)	.83
Uncontrolled hypertension			
1 mo[d]	349 (81.9)	49 320 (84.9)	.09
6 mo[e,f]	213 (66.6)	24 819 (60.2)	.02
All-cause hospital admission			
7 d	35 (8.2)	2311 (4.0)	<.001
8-30 d	48 (11.3)	3897 (6.7)	<.001

Abbreviation: MACE, major adverse cardiovascular events.

[a] Includes emergency department visits, observation, and inpatient hospital admissions. The sensitivity analysis restricted to patients who have follow-up and primary care physicians in our system can be found in eTable 3 in the Supplement.

[b] Calculated using the Pearson χ^2 test.

[c] Includes acute coronary syndromes and stroke or transient ischemic attack.

[d] Last blood pressure reading within 1 month was at least 140/90 mm Hg.

[e] Last blood pressure reading within 6 months was at least 140/90 mm Hg.

[f] Blood pressure readings were missing in 106 patients in the group referred to the hospital and 16 849 patients in the group sent home.

Table 3. Outcomes of Asymptomatic Patients in Propensity-Matched Comparison

Outcome	No. (%) of Patients		P Value[c]
	Referred to Hospital (n = 426)[a]	Sent Home (n = 852)[b]	
MACE[d]			
7 d	2 (0.5)	0	.11[e]
8-30 d	2 (0.5)	0	.11[e]
1-6 mo	4 (0.9)	8 (0.9)	>.99
Uncontrolled hypertension			
1 mo[f]	349 (81.9)	735 (86.3)	.04
6 mo[g,h]	213 (66.6)	393 (64.6)	.56
All-cause hospital admission			
7 d	35 (8.2)	40 (4.7)	.01
8-30 d	48 (11.3)	59 (6.9)	.009

Abbreviation: MACE, major adverse cardiovascular events.

[a] Includes emergency department visits, observation, and inpatient hospital admissions. The sensitivity analysis restricted to patients who have follow-up and primary care physicians in our system can be found in eTable 3 in the Supplement.

[b] Propensity matched in a 2:1 ratio.

[c] Unless otherwise indicated, calculated using the Pearson χ^2 test.

[d] Includes acute coronary syndromes and stroke or transient ischemic attack.

[e] Derived using the Fisher exact test.

[f] Last blood pressure reading within 1 month was at least 140/90 mm Hg.

[g] Last blood pressure reading within 6 months was at least 140/90 mm Hg.

[h] Blood pressure readings were missing in 106 patients in the group referred to the hospital and 244 patients in the group sent home.

(with intravenous delivery in 91 and oral medication in 151), whereas the rest received no intervention. Labetalol hydrochloride (42 [10.9%]) was the most commonly used intravenous drug and clonidine (58 [15.0%]) was the most commonly used oral drug. In the ED, 41 of 748 tests ordered (5.5%) and 39 of 387 patients (10.1%) had an abnormal result (**Table 4**). Of the ED patients, 61 (15.8%) were admitted to an inpatient service and 310 (80.1%) were discharged home. Of the 61 patients admitted from the ED, 9 (14.8%) were admitted for observation, and the mean (SD) length of stay was 3.5 (3.8) days. Among the 310 patients discharged from the ED, a new antihypertensive was added to the home regimen for 82 patients (26.5%), the home dose of antihypertensive therapy was increased for 23 (7.4%) (some patients had both), and no change was made for 257 (82.9%).

Discussion

In this large retrospective cohort study, almost 1 in 20 patients presenting to the outpatient departments had hypertensive urgency, but fewer than 1 in 100 asymptomatic patients were referred to the hospital or ED for management of blood pressure. The rate of MACE in all patients was low.

Table 4. Testing Performed in the ED

Test	No. (%) of Patients (n = 387)		Type of Abnormality (No. of Patients)
	Ordered Tests	Abnormal Test Result	
Basic or complete metabolic panel	247 (63.8)	5 (1.3)	Hypokalemia (3) Acute kidney injury (2)
Urinalysis	115 (29.7)	20 (5.2)	Hematuria (19) Proteinuria (3)
Cardiac enzyme levels	137 (35.4)	2 (0.5)	Elevated biomarker levels (2)
Chest radiography	136 (35.1)	5 (1.3)	Pulmonary edema and infiltrates (4) Pleural effusion (1)
CT of the head	49 (12.7)	0	NA
CT of the chest	11 (2.8)	0	NA
MRI of the brain	2 (0.5)	0	NA
Stress test	3 (0.8)	0	NA
Echocardiography	8 (2.1)	1 (0.3)	Small pericardial effusion (1)
Brain natriuretic peptide level	15 (3.9)	4 (1.0)	Brain natriuretic peptide level elevation (4)
Venous blood gas levels	11 (2.8)	0	NA
Electrocardiography	3 (0.8)	2 (0.5)	Heart block (1) Atrial fibrillation (1)
Other[a]	11 (2.8)	2 (0.5)	Elevated ESR (1) Gallstones (1)

Abbreviations: CT, computed tomography; ED, emergency department; ESR, erythrocyte sedimentation rate; MRI, magnetic resonance imaging; NA, not applicable.

[a] Includes radiography of bones, CT of the abdomen, CT of the aorta, ultrasonography, ESR, and urine toxicology screen.

Referral to the hospital was associated with increased hospitalizations, but not with better outcomes. Disappointingly, most patients with hypertensive urgency still had uncontrolled hypertension 6 months later.

Despite the common nature of the problem, a surprising lack of literature characterizes hypertensive urgency and its outcomes, particularly in the ambulatory setting. Prior studies[10,18,19] report the prevalence of hypertensive crisis in the ED to range from 0.5% to 3% of visits, including those for asymptomatic and symptomatic urgency and patients with emergent visits. In comparison, we found that hypertensive urgency was present in nearly 5% of patients in the office setting, although few were referred to the hospital for management.

Little evidence guides the management of hypertensive urgency. Other than treatment of symptoms, no recommendations exist about who should receive acute management in an emergency setting. What benefit patients get from management in the ED is also unclear. We found that patients who were referred for emergency treatment generally had higher blood pressure but were otherwise similar to those treated in the outpatient setting. Testing results were largely unrevealing. In our study, only 5.5% of tests had an abnormal result and only 8 of 387 patients undergoing testing (2.1%) had evidence of target organ injury. Karras et al[20] and Nishijima et al[21] reported similar rates of meaningful test abnormalities (6% to 7.2%) in patients presenting to the ED with asymptomatic severe hypertension. Moreover, most of these tests could be performed without an ED admission. Interestingly, 142 of our 379 ED patients (37.5%) received no intervention for their blood pressure, 310 of 387 (80.1%) were discharged home, and 257 of 310 (82.9%) did not have a change in their antihypertensive regimen on discharge, which is comparable to previous reports.[20,22]

Hypertensive urgency is a sign of poorly controlled hypertension and is associated in the longer term with end-organ damage, primarily of the heart, brain, and kidneys.[3,5] In the office setting, however, very high blood pressure readings may also be perceived as posing an immediate risk of acute coronary syndrome or stroke, perhaps prompting hospital referral. To date, however, no study has indicated that hypertensive urgency portends acute risk. The few published reports of outcomes in severe hypertension focus on a select subset of symptomatic patients with acute end-organ damage.[23,24] These findings cannot be extrapolated to asymptomatic patients presenting to the office or ED. In our cohort, cardiovascular events occurred in less than 1% of patients within 6 months. In our propensity-matched sample, ED referral was not associated with better 7-day, 8- to 30-day, or 6-month cardiovascular outcomes. A larger concern is long-term uncontrolled hypertension, which poses a more serious risk to patients.[3,5] In our cohort, 59.7% of patients had uncontrolled hypertension at 6 months, and no difference was found between the group sent to the hospital and those sent home. Although less dramatic, uncontrolled hypertension in these patients is a more likely cause of long-term cardiovascular morbidity and mortality. As such, appropriate follow-up and intensification of antihypertensive therapy should be emphasized.

Our study has several important limitations. The study was conducted in a single health care system in Ohio and Florida and may not be generalizable to other regions. However, our system is large and includes a diverse population of more than 1 million patients seen in inner city, suburban, and rural settings. Given our data source—medical record review—we may not have ascertained all outcomes. Additional events could have occurred in other health care systems and sudden cardiac death at home may not have been captured. However, unless such events were more likely to occur in patients sent home, our findings would be unchanged. Death outside the hospital is not reliably captured in our electronic health

record review, so we did not include mortality in our analysis. Given that the major cardiac events were so rare and the referral to the hospital was not associated with a significant difference, mortality was unlikely to be significantly affected. Given the observational nature, our study may be subject to confounding. We were able to successfully match all patients admitted to the hospital with 2 controls, thereby balancing blood pressure, demographics, and important cardiovascular risk factors, but unmeasured confounders may nevertheless have contributed to the observed associations. Last, many of our patients were lost to or unavailable for follow-up. More than 20% of our patients did not have another visit within our health care system within 6 months. These patients in particular may have had important study outcomes that we did not capture. Baseline characteristics of these patients did not differ significantly from those of patients who did return within 6 months, but they may have differed in ways we did not measure. Patients who had a primary care physician designated in the system had better rates of 6-month follow-up (almost 90%), and a sensitivity analysis restricted to these patients did not produce different results.

Our study also has several strengths. To the best of our knowledge, ours is the first study to describe prevalence, characteristics, and outcomes of ambulatory patients presenting with hypertensive urgency across a large health care system. It is also the first study to compare and quantify short-term outcomes depending on the setting of management of hypertensive urgency.

Conclusions

Hypertensive urgency is common in the outpatient setting. In the absence of symptoms of target organ damage, most patients probably can be safely treated in the outpatient setting, because cardiovascular complications are rare in the short term. Furthermore, referral to the ED was associated with increased use of health care resources but not better outcomes. Finally, patients with hypertensive urgency are at high risk for uncontrolled hypertension as long as 6 months after the initial episode. Efforts to improve follow-up and intensify antihypertensive therapy should be pursued.

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Acquisition, analysis, or interpretation of data: Patel, Young, Howell, Hu, Rutecki, Thomas, Rothberg.
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Statistical analysis: Patel, Hu.
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Invited Commentary

LESS IS MORE

Hypertensive Urgency—Is This a Useful Diagnosis?

Iona Heath, MB, BChir, FRCGP, FRCP

In this issue of *JAMA Internal Medicine*, Patel et al[1] interrogate the entity known as *hypertensive urgency* by studying patients who presented within the Cleveland Clinic system with severe hypertension but no symptoms. We are not told why these patients sought medical attention. The authors' very reasonable hypothesis is that "ambulatory patients with hypertensive urgency would have low rates of cardiovascular events in the short term and that referral to the hospital would not improve outcomes."[1] The study substantiates this conjecture. Perhaps unsurprisingly, patients who felt well turned out to be well, and experienced a very small number of serious sequelae. Only 0.7% of the Cleveland Clinic patients were referred to hospital for blood pressure management. These 426 patients triggered higher health care costs but no difference in outcomes. They underwent 748 tests, only 41 (5.5%) of which had abnormal results. All 60 computed tomographic scans ordered (49 of the head and 11 of the chest) had normal findings. These evaluations must represent unnecessary exposure to radiation and potential harm to patients.

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So, with the term *hypertensive urgency*, we seem to have a condition, defined by a raised blood-pressure reading, that causes an enormous amount of anxiety to patients and clinicians alike but that does not require hospital admission and has a good prognosis. Malignant hypertension used to be a rare diagnosis with a poor prognosis; now we are told that hypertensive urgency occurs in 4.6% of all office visits in an American health care system, while its implications seem much less serious. It is time that we acknowledged that disease in the absence of symptoms may be a very different phenomenon from symptomatic disease, or as Hoffman and Cooper[2(p1124)] put it, "we must recognize the enormous difference between a disease that presents clinically and 'the same' disease that is found only because we have decided to search for it, in the absence of compelling clinical concern." It seems likely that this enormous difference is driving much diagnostic drift and overdiagnosis, compounded by the perverse incentives of pay-for-performance systems.

Some confirmation of the latter is provided by a study[3] that reported national trends in hospital admissions for various hypertension diagnoses. The main findings were of substantial rises in the number of admissions for both malignant hypertension and hypertensive encephalopathy after 2007, whereas discharges for essential hypertension fell, and there was no change for the combination of the 3 diagnoses. The implication is that patients who would previously have been labeled as having essential hypertension were being diagnosed with malignant hypertension or hypertensive encephalopathy. The increased seriousness of the diagnoses was not correlated with the levels of morbidity that might have been expected and, although health care costs rose, length of stay fell, and mortality for malignant hypertension fell markedly. The conclusion was that these findings were not real changes in the severity of disease but changes dictated by pressures to code according to severity in order to be remunerated. Such bureaucratic procedures drive overdiagnosis with no understanding of the additional burden of fear imposed on both patients and clinicians as a direct result.

As a biometric variable that changes all the time in response to experience and emotion, BP is a conundrum. It is never static, so a single isolated reading can be very misleading, especially if the patient is frightened, unwell, or stressed. Hypertension in itself is not a disease but a risk factor for other diseases. It has been studied for decades, and yet there seems to be a fundamental confusion within the current classification. The most serious category is a hypertensive emergency, when symptoms and signs suggestive of encephalopathy are combined with very high BP readings. This situation always requires hospital admission. Much more common is chronically raised BP with readings persistently raised readings above 160/100 mm Hg[4]; this is undoubtedly a significant risk factor for diseases such as coronary heart disease or stroke. Reducing these levels of BP through lifestyle modification or medication lowers the risk and benefits patients. A third intermediate category is *hypertensive urgency*. In the absence of symptoms, this turns out to be largely illusory and no more serious than a single isolated reading of high BP. Nevertheless, people are being admitted to hospital and treated with powerful medications, incurring unwarranted costs, and causing harm to patients in terms of needless fear, stress, and the adverse effects of medication.

More than 80% of the patients in the Cleveland Clinic study had BP above the stated target of 140/90 mm Hg 1 month after the diagnosis of hypertensive urgency and more than 60%, 6 months afterwards. Yet more than one-half of these patients were already taking 2 or more antihypertensives and more than one-third were taking 3 or more. Every frontline clinician is well aware how difficult these BP targets are to achieve, especially in the context of systolic hypertension in older

Supplementary Online Content

Patel KK, Young L, Howell EH, et al. Characteristics and outcomes of patients presenting with hypertensive urgency in the office setting. *JAMA Intern Med.* Published online June 13, 2016. doi:10.1001/jamainternmed.2016.1509.

eFigure. Study Flowchart

eTable 1. Comparison of Baseline Characteristics Between Patients Referred to the Hospital and Propensity-Matched Sample From Patients Sent Home

eTable 2. Comparison of Baseline Characteristics Between Patients With and Without Follow-up Between Patients Referred to the Hospital and the Propensity-Matched Sample From Patients Sent Home

eTable 3. Sensitivity Analyses for the Outcomes of Patients With Follow-up Defined as Patients With at Least 1 Repeated Blood Pressure Measurement Within 6 Months of Baseline Visit

eTable 4. Baseline Characteristics of Patients Presenting With Hypertensive Urgency to the Office (Systolic BP ≥200 mm Hg)

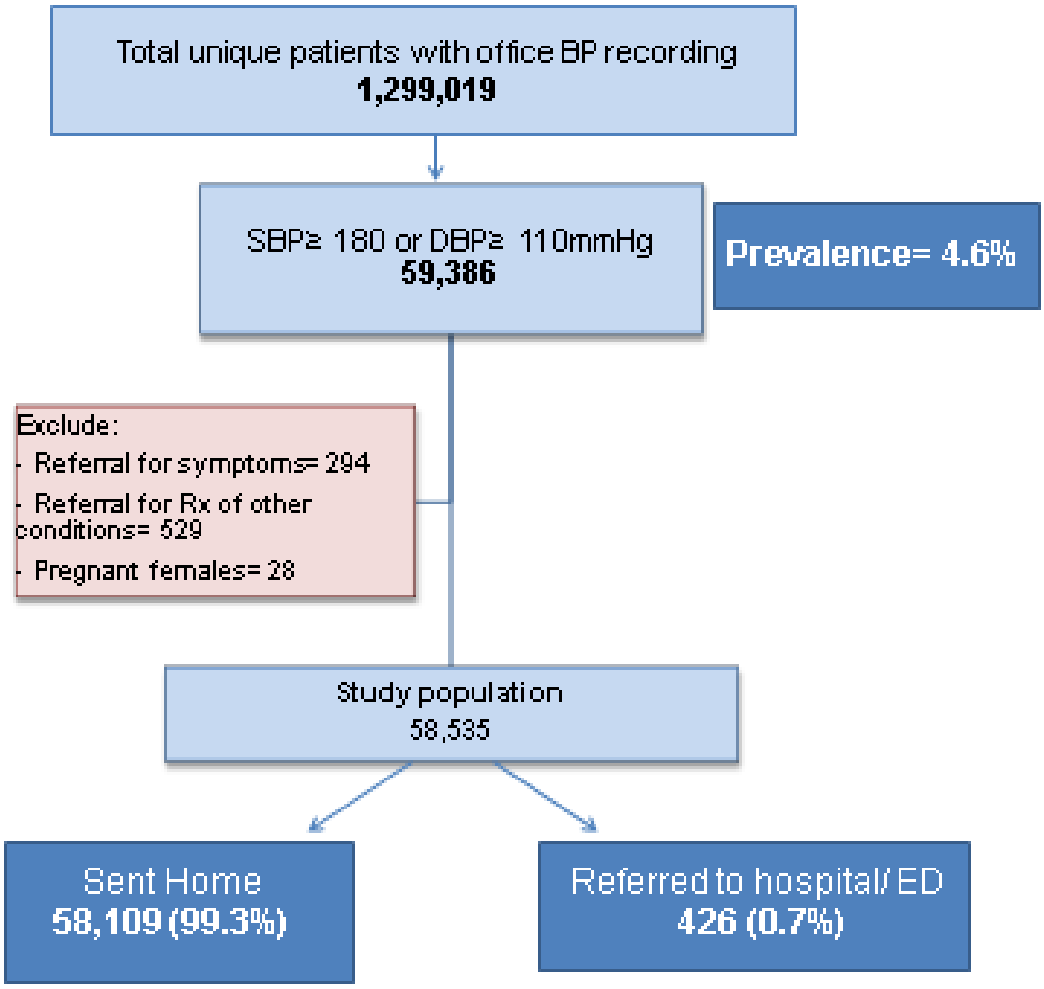
eTable 5. Unadjusted Outcomes of Patients Presenting With Hypertensive Urgency to the Office (Systolic BP ≥200 mm Hg)

eTable 6. Baseline Characteristics of Patients Presenting With Hypertensive Urgency to the Office (Systolic BP ≥220 mm Hg)

eTable 7. Unadjusted Outcomes of Patients Presenting With Hypertensive Urgency to the Office (Systolic BP ≥220 mm Hg)

This supplementary material has been provided by the authors to give readers additional information about their work.

eFigure. Study Flowchart



eTable 1. Comparison of baseline characteristics between patients referred to the hospital and propensity matched sample from patients sent home.

Characteristic	Referred to hospital (ED/inpatient) (n=426) Mean ± S.D or N(%)	Matched sample from patients sent home (n=852) Mean ± S.D or N(%)	p-value[a]
Age (years)	58.66 ± 16.16	58.1 ± 15.05	0.55
Female gender	266 (62.4)	527 (61.9)	0.84
Race, White	255 (59.9)	485 (56.9)	0.59
Race, Black	157 (36.9)	335 (39.3)	
Race, Other	14 (3.3)	32 (3.8)	
Systolic BP (mmHg)	198.41 ± 22.09	198.08 ± 24.15	0.81
Diastolic BP (mmHg)	107.37 ± 17.39	108.12 ±17.96	0.48
Hypertension	403 (94.6)	802 (94.1)	0.73
Diabetes	121 (28.4)	251 (29.5)	0.7
Smoking	230 (54)	445 (52.2)	0.55
Coronary Artery Disease	77 (18.1)	142 (16.7)	0.53
Hyperlipidemia	186 (43.7)	335 (39.3)	0.14
Chronic Kidney Disease	71 (16.7)	130 (15.3)	0.51
Dialysis	19 (4.5)	44 (5.2)	0.58
Stroke/TIA	24 (5.6)	41 (4.8)	0.53
Number of medications	2.01 ± 1.74	2.02 ± 1.58	0.87
BP follow-up	368 (86.4)	691 (81.1)	0.02

BP: blood pressure; TIA: transient ischemic attack

[a] Calculated using unpaired t-test for continuous variables and Pearson's chi-square test for categorical variables (all 2-tailed)

eTable2. Comparison of baseline characteristics between patients with and without follow-up between patients referred to the hospital (2a) and the propensity-matched sample from patients sent home (2b)

Table 2a. Comparison of baseline characteristics of patients followed and lost to follow-up (Total number of patients referred to the hospital, N= 426)

Characteristic	Patients with follow-up (n=368) Mean ± S.D. or N(%)	Patients without follow-up (n=58) Mean ± S.D. or N (%)	p-value[a]
Age (years)	58.4 ±15.9	60.31 ± 17.5	0.44
Female gender	235 (63.9)	31 (53.4)	0.13
Race, White	218 (59.2)	37 (63.8)	0.79
Race, Black	138 (37.5)	19 (32.8)	
Race, Other	12 (3.3%)	2 (3.4)	
Systolic BP (mmHg)	198.3 ± 22.4	199.4 ± 20.1	0.70
Diastolic BP (mmHg)	107.3± 17.4	108.1 ± 17.3	0.75
Hypertension	347 (94.3)	56 (96.6)	0.48
Diabetes	111 (30.2)	10 (17.2)	0.04
Smoking	201 (54.6)	29 (50)	0.51
Coronary Artery Disease	65 (17.7)	12 (20.7)	0.58
Hyperlipidemia	170 (46.2)	16 (27.6)	0.01
Chronic Kidney Disease	65 (17.7)	6 (10.3)	0.17
Dialysis	17 (4.6)	2 (3.4)	0.69
Stroke/TIA	22 (6)	2 (3.4)	0.44
Number of BP medications	2.01 ± 1.8	1.97 ± 1.7	0.85
Body mass index (kg/m^2)	31.5 ± 9.0	30.2 ± 7.5	0.34

BP: blood pressure, TIA: transient ischemic attack

[a] Calculated using unpaired t-test for continuous variables and Pearson's chi-square test for categorical variables (all 2-tailed)

Table 2b. Comparison of baseline characteristics of patients followed and lost to follow-up (Total number of patients sent home in the propensity matched, N=852)

Characteristic	Patients with follow-up (n= 691) Mean ± (S.D) or N(%)	Patients without follow-up (n=161) Mean ± (S.D) or N (%)	p-value[a]
Age (years)	57.6 ± 14.7	60.3 ± 16.3	0.06
Female gender	434 (62.8)	93 (57.8)	0.24
Race, White	385 (55.7)	100 (62.1)	0.03
Race, Black	284 (41.1)	51 (31.7)	
Race, Other	22 (3.2)	10 (6.2)	
Systolic BP (mmHg)	197.9 ± 24.8	198.9 ± 21.0	0.6
Diastolic BP (mmHg)	108.5 ± 17.6	106.6 ± 19.5	0.25
Hypertension	657 (95.1)	145 (90.1)	0.02
Diabetes	219 (31.7)	32 (19.9)	0.003
Smoking	371 (53.7)	74 (46)	0.08
Coronary Artery Disease	115 (16.6)	27 (16.8)	0.97
Hyperlipidemia	278 (40.2)	57 (35.4)	0.26
Chronic Kidney Disease	115 (16.6)	15 (9.3)	0.02
Dialysis	41 (5.9)	3 (1.9)	0.04
Stroke/TIA	35 (5.1)	6 (3.7)	0.48
Number of BP medications	2.1 ± 1.6	1.7 ± 1.5	0.008
Body mass index (kg/m^2)	32.8 ± 9.1	32.07 ± 8.2	0.44

BP: blood pressure, TIA: transient ischemic attack

[a] Calculated using unpaired t-test for continuous variables and Pearson's chi-square test for categorical variables (all 2-tailed)

eTables 3a-d. Sensitivity analyses for the outcomes of Patients with follow-up defined as patients with at least 1 repeat blood pressure measurement within 6 months of baseline visit.

eTable 3a. Unadjusted outcomes of patients with hypertensive urgency *(restricted to patients with follow-up)*[#].

Outcome	Referred to the hospital (ED/inpatient) (N=368) N(%)	Sent Home (N=45556) N(%)	p-value[a]
7 day MACE event	2 (0.5)	60 (0.1)	**0.03**
8-30 day MACE event	2 (0.5)	117 (0.3)	0.28
1-6 month MACE event	4 (1.1)	491 (1.1)	0.99
Uncontrolled hypertension at 1 month*	291 (79.1)	36767 (80.7)	0.43
Uncontrolled hypertension at 6 months**	213 (66.6)	24819 (60.2)	**0.02**
All-cause 7 day hospital admission	33 (9)	2068 (4.5)	**<0.001**
All-cause 8-30 day hospital admission	48 (13)	3717 (8.2)	**0.001**

[#]Patients with follow-up defined as patients with at least one repeat blood pressure measurements within 6 months of baseline visit.

*Last blood pressure within 1month ≥ 140/90mmHg. ** Last blood pressure within 6 months ≥140/90mmHg.

MACE: major adverse cardiovascular events: includes Acute coronary syndromes, Stroke/Transient ischemic attack

Hospital admission includes emergency department visits, observation and inpatient hospital admissions

[a] Calculated using Pearson's chi-square test

eTable 3b. Outcomes of asymptomatic patients sent to the ED/inpatient compared to propensity matched patients sent home *(restricted to patients with follow-up)*[#].

Outcome	Referred to the hospital (ED/inpatient) (N=368)	Sent home (N=691)	p-value [a]
7 day MACE event	2 (0.5)	0 (0)	0.12^
8-30 day MACE event	2 (0.5)	0 (0)	0.12^
1-6 month MACE event	4 (1.1%)	8 (1.2)	0.92
Uncontrolled hypertension at 1 month*	291 (79.1)	574 (86.1)	0.11
Uncontrolled hypertension at 6 months**	213 (66.6)	393 (64.6)	0.56
All-cause 7 day hospital admission	33 (9)	38 (5.5)	**0.03**
All-cause 30 day hospital admission	48 (13)	56 (8.1)	**0.01**

[#]Patients with follow-up defined as patients with at least one repeat blood pressure measurements within 6 months of baseline visit.

*Last blood pressure within 1month ≥ 140/90mmHg. ** Last blood pressure within 6 months ≥140/90mmHg.

^ p-values derived using the Fisher's exact test

MACE: major adverse cardiovascular events: includes Acute coronary syndromes, Stroke/Transient ischemic attack

Hospital admission includes emergency department visits, observation and inpatient hospital admissions

[a] Unless otherwise indicated, calculated using Pearson's chi-square test

eTable 3c. Unadjusted outcomes of patients with hypertensive urgency *(restricted to patients with primary care providers in our system with follow-up)*[#].

Outcome	Referred to the hospital (ED/inpatient) (N=163) N(%)	Sent Home (N=22648) N(%)	p-value [a]
7 day MACE event	2 (1.2)	21 (0.1)	**0.01**^
8-30 day MACE event	1 (0.6)	53 (0.2)	0.32^
1-6 month MACE event	1 (0.6)	240 (1.1)	1.00^
Uncontrolled hypertension at 1 month*	116 (71.2)	17810 (78.6)	**0.02**
Uncontrolled hypertension at 6 months**	91 (61.1)55.8	11581 (55.2)	0.15
All-cause 7 day hospital admission	14 (8.6)	718 (3.2)	**<0.001**
All-cause 8-30 day hospital admission	18 (11)	1411 (6.2)	**0.01**

[#]Patients with follow-up defined as patients with at least one repeat blood pressure measurements within 6 months of baseline visit.

A total of 25,997 patients (44.2%) had a primary care provider in our system.

*Last blood pressure within 1month ≥ 140/90mmHg. ** Last blood pressure within 6 months ≥140/90mmHg.

^p-values derived using the Fisher's exact test

MACE: major adverse cardiovascular events: includes Acute coronary syndromes, Stroke/Transient ischemic attack

Hospital admission includes emergency department visits, observation and inpatient hospital admissions

[a] Unless otherwise indicated, calculated using Pearson's chi-square test

eTable 3d. Outcomes of asymptomatic patients sent to the ED/inpatient compared to propensity-matched patients sent home *(restricted to patients with primary care providers in our system with follow-up)*[#].

Outcome	Referred to the hospital (ED/inpatient) (N=163)	Sent home (N=350)	p-value [a]
7 day MACE event	2 (1)	0 (0)	0.10^
8-30 day MACE event	1 (1)	0 (0)	0.32^
1-6 month MACE event	1 (1)	7 (2)	0.45^
Uncontrolled hypertension at 1 month*	116 (71.2)	286 (81.7)	**0.01**
Uncontrolled hypertension at 6 months**	91 (61.1)	182 (57.4)	0.45
All-cause 7 day hospital admission	14 (8.6)	15 (4.3)	**0.049**
All-cause 30 day hospital admission	18 (11)	20 (5.7)	**0.03**

[#]Patients with follow-up defined as patients with at least one repeat blood pressure measurements within 6 months of baseline visit.

*Last blood pressure within 1month ≥ 140/90mmHg. ** Last blood pressure within 6 months ≥140/90mmHg.

^ p-values derived using the Fisher's exact test

MACE: major adverse cardiovascular events: includes Acute coronary syndromes, Stroke/Transient ischemic attack

Hospital admission includes emergency department visits, observation and inpatient hospital admissions

[a] Unless otherwise indicated, calculated using Pearson's chi-square test

eTable 4. Baseline characteristics of patients presenting with hypertensive urgency to the office (Systolic BP ≥ 200 mmHg)

Factor	**Referred to hospital (N=218)** Mean (SD) or N (%)	**Sent Home (N=5745)** Mean (SD) or N (%)	**p-value** [a]
Age (years)	62.19 (15.42)	66.82 (13.87)	**<0.001**
Female	136 (62.4%)	3578 (62.3%)	0.975
Race Caucasian African American Other	 125 (57.3) 84 (38.5) 9 (4.1)	 4207 (73.2) 1265 (22) 273 (4.8)	**<0.001**
Systolic BP (mmHg)	215.56 (14.15)	209.86 (11.27)	**<0.001**
Diastolic BP (mmHg)	108.7 (18.61)	98.56 (16.67)	**<0.001**
Body Mass Index (kg/m2)	30.81 (8.23)	31.05 (7.6)	0.732
Hypertension	211 (97.2%)	4453 (77.8%)	**<0.001**
Diabetes	67 (30.7%)	1585 (27.6%)	0.309
Smoking	121 (55.8%)	2713 (47.4%)	**0.015**
Coronary Artery Disease	44 (20.3%)	1238 (21.6%)	0.636
Hyperlipidemia	99 (45.4%)	2618 (45.6%)	0.964
Chronic Kidney Disease	46 (21.1%)	797 (13.9%)	**0.003**
Stroke/TIA	18 (8.3%)	380 (6.6%)	0.340
Taking ≥ 2 BP medications	139 (63.8%)	3950 (68.8%)	0.119
Taking ≥ 3 BP medications	94 (43.1%)	2787 (48.5%)	0.118
Thiazide Diuretic	34 (16.8%)	1145 (20.8%)	0.168
ACE-I/ ARB	83 (41.1%)	2657 (48.3%)	**0.043**
Beta-blockers	104 (51.5%)	3060 (55.7%)	0.239
Calcium Channel Blockers	60 (29.7%)	1767 (32.2%)	0.464
Hydralazine	16 (7.9%)	411 (7.5%)	0.814

Clonidine	36 (17.8%)	707 (12.9%)	**0.040**
Potassium Sparing Diuretics	19 (9.4%)	408 (7.4%)	0.293
Loop Diuretic	37 (18.3%)	960 (17.5%)	0.755
Nitrates	17 (8.4%)	514 (9.4%)	0.653
Number of medications			
0	31 (15.3%)	691 (12.6%)	0.577
1	32 (15.8%)	855 (15.6%)	
2	45 (22.3%)	1163 (21.2%)	
≥ 3	94 (46.5%)	2787 (50.7%)	

BP: blood pressure. ACE-I : Angiotensin Converting Enzyme Inhibitors. ARB: Angiotensin Receptor Blockers TIA: transient ischemic attack

[a] Calculated using unpaired t-test for continuous variables and Pearson's chi-square test for categorical variables (all 2-tailed)

Table 5. Unadjusted outcomes of patients presenting with hypertensive urgency to the office (Systolic BP ≥ 200 mm Hg)

Outcome	Referred to the hospital (ED/inpatient) (N=218) N(%)	Sent Home (N=5745) N(%)	p-value [a]
7 day MACE event	0 (0%)	13 (0.2%)	1.00^
8-30 day MACE event	2 (0.9%)	17 (0.3%)	0.15^
1-6 month MACE event	1 (0.5%)	63 (1.1%)	0.73^
Uncontrolled hypertension at 1 month*	175 (80.3%)	5010 (87.2%)	**0.003**
Uncontrolled hypertension at 6 months**	117 (71.3%)	2596 (66.3%)	0.18
All-cause 7 day hospital admission	13 (6%)	264 (4.6%)	0.35
All-cause 8-30 day hospital admission	19 (8.7%)	431 (7.5%)	0.51

*Last BP within 1month ≥ 140/90mmHg. ** Last BP within 6 months ≥ 140/90mmHg.

MACE: major adverse cardiovascular event: includes acute coronary syndromes, stroke/transient ischemic attack

Hospital admission includes emergency department visits, observation and inpatient hospital admissions.

^ p-values derived using the Fisher's exact test

[a] Unless otherwise indicated, calculated using Pearson's chi-square test

Table 6. Baseline characteristics of patients presenting with hypertensive urgency to the office (Systolic BP ≥220 mm Hg)

Factor	Referred to hospital (N=81) Mean ± S.D. or N (%)	Sent Home (N=977) Mean ± S.D. or N (%)	p-value [a]
Age (years)	61.09 (15.86)	66.09 (13.76)	**0.007**
Female	46 (56.8%)	620 (63.5%)	0.23
Race Caucasian African American Other	 47 (58%) 30 (37%) 4 (4.9%)	 713 (73%) 209 (21.4%) 55 (5.6%)	**<0.001**
Systolic BP (mmHg)	230.62 (11.16)	228.45 (13.39)	0.10
Diastolic BP (mmHg)	111.1 (20.58)	105.46 (18.82)	**0.02**
Body Mass Index (kg/m2)	29.71 (8.01)	30.92 (7.53)	0.3
Hypertension	80 (98.8%)	763 (78.3%)	**<0.001**
Diabetes	23 (28.4%)	264 (27%)	0.79
Smoking	47 (58%)	444 (45.6%)	**0.03**
Coronary Artery Disease	21 (25.9%)	201 (20.6%)	0.26
Hyperlipidemia	39 (48.1%)	415 (42.5%)	0.32
Chronic Kidney Disease	19 (23.5%)	141 (14.4%)	**0.03**
Stroke/TIA	11 (13.6%)	63 (6.4%)	**0.02**
Taking ≥ 2 BP medications	53 (65.4%)	678 (69.4%)	0.46
Taking ≥ 3 BP medications	40 (49.4%)	492 (50.4%)	0.87
Thiazide Diuretic	12 (16.2%)	188 (20.4%)	0.39
ACE-I/ ARB	32 (43.2%)	464 (50.4%)	0.24
Beta-blockers	43 (58.1%)	499 (54.2%)	0.51
Calcium Channel Blockers	29 (39.2%)	303 (32.9%)	0.27
Hydralazine	7 (9.5%)	87 (9.4%)	0.1

Clonidine	13 (17.6%)	156 (16.9%)	0.89
Potassium Sparing Diuretics	7 (9.5%)	66 (7.2%)	0.47
Loop Diuretic	12 (16.2%)	164 (17.8%)	0.73
Nitrates	9 (12.2%)	90 (9.8%)	0.51
Number of medications			
0	11 (14.9%)	114 (12.4%)	0.9
1	10 (13.5%)	129 (14%)	
2	13 (17.6%)	186 (20.2%)	
≥ 3	40 (54.1%)	492 (53.4%)	

BP: blood pressure. ACE-I : Angiotensin Converting Enzyme Inhibitors. ARB: Angiotensin Receptor Blockers TIA: transient ischemic attack

[a] Calculated using unpaired t-test for continuous variables and Pearson's chi-square test for categorical variables (all 2-tailed)

Table 7. Unadjusted outcomes of patients presenting with hypertensive urgency to the office (Systolic BP ≥220 mm Hg)

Outcome	Referred to the hospital (ED/inpatient) (N=81) N(%)	Sent Home (N=977) N(%)	p-value [a]
7 day MACE event	0 (0%)	2 (0.2%)	1.00^
30 day MACE event	0 (0%)	5 (0.5%)	0.38^
6 month MACE event	0 (0%)	11 (1.1%)	1.00^
Uncontrolled hypertension at 1 month*	18 (22.2%)	120 (12.3%)	**0.01**
Uncontrolled hypertension at 6 months**	16 (26.7%)	220 (33.3%)	0.29
All-cause 7 day hospital admission	5 (6.2%)	36 (3.7%)	0.27
All-cause 8-30 day hospital admission	8 (9.9%)	59 (6%)	0.17

*Last BP within 1 month ≥ 140/90mmHg. ** Last BP within 6 months ≥ 140/90mmHg.

MACE: major adverse cardiovascular event: includes acute coronary syndromes, stroke/transient ischemic attack

Hospital admission includes emergency department visits, observation and inpatient hospital admissions.

^ p-values from the Fisher's exact test

[a] Unless otherwise indicated, calculated using Pearson's chi-square test

