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Original Contributions

Missed Opportunities to Diagnose and Treat Asymptomatic Hypertension in Emergency Departments in the United States, 2016-2019

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□ **Abstract—Background: Fewer than one-half of U.S. adults with hypertension (HTN) have it controlled and one-third are unaware of their condition. The emergency department (ED) represents a setting to improve HTN control by increasing awareness of asymptomatic hypertension (aHTN) according to the 2013 American College of Emergency Physicians asymptomatic elevated blood pressure clinical policy. Objective: The aim of the study was to estimate the prevalence and management of aHTN in U.S. EDs. Methods: We examined the 2016–2019 National Hospital Ambulatory Medical Care Surveys to provide a more valid estimate of aHTN visits in U.S. EDs. aHTN is defined as adult patients with blood pressure ≥ 160/100 mm Hg at triage and discharge without trauma or signs of end organ damage. We then stratified aHTN into a 160–179/100–109 mm Hg subgroup and > 180/110 mm Hg subgroup and examined diagnosis and treatment outcomes. Results: Approximately 5.9% of total visits between 2016 and 2019 met the definition for aHTN and 74% of patients were discharged home, representing an estimated 26.5 million visits. Among those discharged home, emergency physicians diagnosed 13% (95% CI 10.6–15.8%) and treated aHTN in 3.9% (95% CI 2.8–5.5%) of patients in the higher aHTN subgroup. In the lower aHTN subgroup, diagnosis and treatment decreased to 3.1% (95% CI 2.4–4.1%) and 1.2% (95% CI 0.7–2.0%), respectively. Conclusions: Millions of ED patients found to have aHTN are discharged home without diagnosis or treatment. Although management practices follow clinical policy to delay treatment of aHTN, there are missed opportunities to diagnosis aHTN.**

□ **Keywords—hypertension; asymptomatic hypertension; blood pressure; population health; antihypertension**

Introduction

Of the 116 million adults in the United States with hypertension (HTN), only 44% are controlled to maintain a blood pressure < 140/90 mm Hg and one-third are unaware of their condition (1,2). In 2009, 38% of deaths in women and 30% in men were from cardiovascular disease due to HTN (3). In 2014–2015, HTN was estimated to cost society $55.9 billion, with projections of up to $220.9 billion in 2035 (2). Early management of HTN prevents complications, such as myocardial infarction, stroke, and renal failure. Even reductions as small as 10–20 mm Hg in systolic blood pressure (SBP) result in reduced risk of cardiovascular disease (4).

Between 2006 and 2012, nearly one-quarter of all adult emergency department (ED) visits were related to HTN, and this was observed to increase by 5.2% each

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year. More than one-half of these patients were discharged home from the ED (5). In 2016, in a total of 1,016,000 ED visits, patients had a primary diagnosis of essential HTN (2). Swiftly resolving HTN in symptomatic patients, or those with acute end organ complications, leads to improved clinical outcomes, whereas doing so in asymptomatic HTN (aHTN) may be associated with adverse effects, such as stroke (6).The 2013 American College of Emergency Physicians (ACEP) clinical policy on asymptomatic elevated blood pressure defined aHTN as markedly elevated blood pressure (≥ 160/100 mm Hg) without clinical evidence of acute end organ damage (7). This definition of aHTN includes all patients with elevated blood pressure, regardless of a prior diagnosis of HTN. The policy recommends diagnosing and referring all patients with aHTN to primary care for treatment. In addition, for patients in certain contexts when the risks outweigh the benefits, the policy states that treatment may be initiated in the ED or at discharge (7). This policy provided emergency physicians an opportunity to increase patient awareness of aHTN and consider treatment in high-risk populations; however, the literature describing this is limited.

Both measurement and classification of aHTN seen in prior studies are limited. Mullins et al. used 2006–2015 National Hospital Ambulatory Medical Care Survey (NHAMCS) data to examine ED visits on the basis of a chief symptom of HTN regardless of HTN measurement or disposition (8). Goldberg et al. used 2005–2015 NHAMCS data to analyze trends in visits with a single HTN value on arrival to the ED that resulted in discharge (9). Neither study included visits made by patients with more than one HTN measurement, which serves as a more reliable measure of HTN than a single reading (10). In addition, neither study used diagnostic codes to exclude symptomatic HTN, which is important because these patients were presumably treated. Lastly, neither study included an HTN measurement at discharge when secondary causes of HTN, such as pain or anxiety, can be reasonably presumed to have been partially or completely addressed.

The objective of this study was to use NHAMCS to present a more accurate estimate of aHTN visits in the United States. We addressed measurement and classification limitations in prior studies by including visits with aHTN regardless of symptom, requiring aHTN measurements at both triage and discharge, and excluding symptomatic patients. We then describe patient-, hospital-, and clinical-level characteristics for ED visits with aHTN and describe diagnosis and treatment practices in patients with moderate (160–179/100–109 mm Hg) and severe (> 180/110 mm Hg) aHTN.

Materials and Methods

Study Design and Setting

This study was a secondary analysis of the 2016–2019 NHAMCS (11). NHAMCS uses a four-stage probability design, collecting a nationally representative sample of ED visits based on noninstitutional general and short-stay hospitals. The Ethics Review Board of the National Center for Health Statistics approves the NHAMCS annually. The University of California, San Francisco Institutional Review Board approved this study.

Data Collection and Processing

Each year, U.S. Census Bureau field representatives complete patient record forms for each sampled visit during a randomly assigned 4-week reporting period. The data collected include information on patient and hospital demographic characteristics, chief symptom, vital signs, medications rendered or prescribed, diagnosis determined, and disposition. Approximately 60% of sampled hospitals participated in the survey and approximately 52% of sampled EDs provided complete information on their sample visits, for a total response rate of 52% (11).

Study Population

The definition of aHTN used in this study is inspired by the inclusion and exclusion criteria for the 2013 ACEP asymptomatic elevated blood pressure clinical policy. Only ED visits from 2016–2019 with blood pressure ≥ 160/100 mm Hg at both triage and discharge were included in the study because blood pressure was reliably documented during these study years. The focus of this study was patients found to have aHTN who were discharged home, as this population could possibly receive a prescription. Discharge visits were defined as visits marked as "no follow-up planned/return to ED" and "return/refer to physician clinic." Visits not meeting the definition of aHTN were excluded. This included patients with signs and symptoms of acute end organ injury, pregnancy, or other emergent conditions that cause elevated blood pressure, such as trauma and substance use (Figure 1). The *International Classification of Diseases, Tenth Revision* (ICD-10) codes used to identify these conditions can be found in the Appendix (12).

Study Outcomes

Patient characteristics, including age (18–34, 35–50, 51–64, and ≥ 65 years), sex, race and ethnicity, and

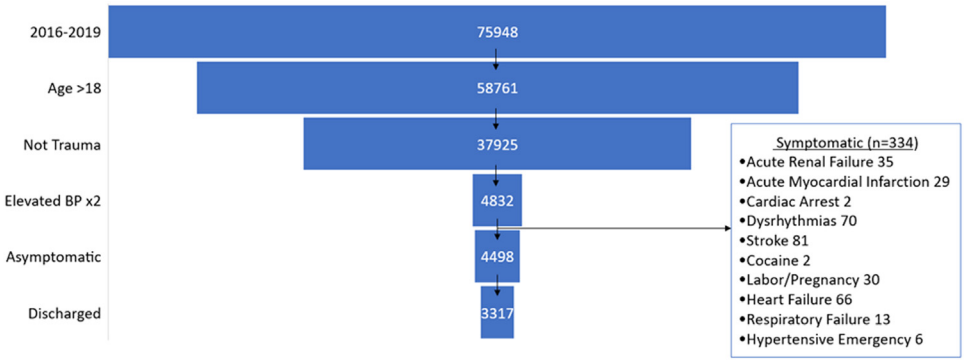

Figure 1. Flow chart of study population. BP = blood pressure.

residence, were defined using established NHAMCS categories. Insurance was categorized as private, Medicare, Medicaid, no insurance (i.e., self-pay or charity/no charge), and other (i.e., other, worker's compensation, unknown, or missing).

We present hospital-level variables, including teaching vs. nonteaching hospital, U.S. Census Bureau geographical region (Northeast, Midwest, South, and West), and urban vs. rural institution. An institution was urban if present within a Standard Metropolitan Statistical Area.

We presented clinical-level variables, such as triage and discharge aHTN values, primary reason for visit, pain scale, and chronic conditions. Comparisons were made between 2 aHTN groups; aHTN = 160–179 mm Hg SBP or 100–109 mm Hg diastolic blood pressure (DBP) vs, aHTN $\geq$ 180 mm Hg SBP or $\geq$ 110 mm Hg DBP. If either SBP or DBP were out of range, they were included in the group. If SBP or DBP met criteria for both groups, then the patient was placed in the higher BP group. These groups were chosen to reflect the most commonly used definitions for aHTN in the literature (7). NHAMCS includes up to 5 reasons for visits in order of significance. HTN was considered the primary reason for a visit if it was listed first. Triage pain scale was categorized as no pain, 1–5, 6–10, and missing. Chronic conditions were defined using established NHAMCS categories. aHTN diagnosis was defined using ICD-10 I10, I119, I129, I150, I151, I152, I158, I159, I6, and I69. These ICD-10 codes were matched to *International Classification of Diseases, Ninth Revision, Clinical Modification* codes: 401–405 (inclusive) and 437.2.13,14 used in prior studies to accurately identify HTN-related ED visits (8,13). The codes included essential HTN, hypertensive heart disease without heart failure, secondary HTN, hypertensive crisis, and hypertensive urgency.

We included whether an antihypertensive medication was administered in the ED, at discharge as a prescription, or both. A medication was defined as antihypertensive if it belonged to one of the following classes from the ambulatory care drug database system: angiotensin converting enzyme inhibitors, angiotensin II inhibitors, calcium channel blocking agents, diuretics, aldosterone receptor antagonists, β-adrenergic blocking agents, antiadrenergic agents, peripherally acting, antiadrenergic agents, centrally acting, vasodilators, renin inhibitors, antihypertensive combinations, angiotensin receptor blockers, and neprilysin inhibitors (14).

Statistical Analysis

Data files for survey years 2016–2019 were downloaded from the NHAMCS website (11). In a step-wise fashion, we used pre-existing NHAMCS variables to isolate 2016–2019 visits of adults with no trauma and elevated BP at both triage and discharge (Figure 1). ICD-10 codes were used to exclude cases with symptomatic hypertension to isolate aHTN (Appendix) (12). In addition, we used pre-existing variables to isolate cases that were discharged home (Figure 1). The statistics contained in the survey data files reflect only a sample of patient visits—not a complete count of all such visits that occurred in the United States. NHAMCS instructs researchers to apply the "patient visit weight" variable on the survey sample data to generate a complete count of all ED visits (11). We applied the "patient visit weight" variable to the survey data in order to provide a total estimate of all ED visits for aHTN. We used descriptive terms to present both unweighted (survey data) and weighted (estimate of total data) estimates. Point estimates with 95% CIs were calculated by the authors (A.A.) using standard methods in STATA, version 17.0 (StataCorp) accounting for complex survey design and sampling weights. Pearson's χ^2 test was used to assess mean differences for categorical variables (aHTN diagnosis and aHTN medication given in ED, at discharge, or both).

Results

During the 4 survey years (2016–2019), the NHAMCS surveyors sampled 75,948 ED visits (unweighted). Ap-

Table 1. Characteristics of Discharged Emergency Department Visits with Asymptomatic Hypertension, National Hospital Ambulatory Medical Care Survey 2016-2019.

Characteristic	Total: Unweighted n = 3317, Weighted n = 26,497,348	Weighted %	95% CI, %
Patient			
Age			
18–34 years	429	12.8	11.5–14.2
35–50 years	872	25.6	23.7–27.6
51–64 years	887	26.2	24.3–28.2
> 65 years	1129	35.5	32.9–38.1
Sex			
Female	1921	58.8	56.3–61.2
Male	1396	41.2	38.8–43.7
Race/ethnicity			
Non-Hispanic White	2020	62.5	57.4–67.3
Non-Hispanic Black	842	24.4	20.5–28.8
Hispanic	328	10.3	8.3–12.8
Non-Hispanic other	127	2.8	1.9–4.1
Insurance status			
Private insurance	883	25.4	23.3–27.7
Medicare	1190	36.7	33.9–39.6
Medicaid	667	18.1	15.9–20.6
No insurance*	263	8.7	7.1–10.7
Other†	314	11.1	8.3–14.7
Patient residence			
Private residence	3145	94.8	93.3–96.0
Nursing home	31	0.9	0.6–1.5
Homeless/homeless shelter	48	0.7	0.4–1.3
Other	93	3.5	2.4–5.1
Hospital			
ED teaching status			
Nonacademic	2822	88.4	85.0–91.0
Academic	495	11.6	9.0–15.0
ED hospital region			
Northeast	499	13.7	9.9–18.8
Midwest	768	19.9	15.4–25.3
South	1283	45.5	38.3–52.9
West	767	20.8	15.8–26.9
Metropolitan Statistical Area			
Urban	2771	81.3	70.4–88.8
Rural	546	18.7	11.2–29.6
Clinical			
Primary reason for visit‡			
Hypertension	183	6.0	5.0–7.1
Triage and discharge blood pressure, mm Hg			
SBP 160–179 mm Hg or DBP 100–109 mm Hg	1975	58.8	56.7–60.8
SBP 180+ mm Hg or DBP 110+ mm Hg	1342	41.2	39.2–43.3

(*continued on next page*)

Table 1. (*continued*)

Characteristic	Total: Unweighted n = 3317, Weighted n = 26,497,348	Weighted %	95% CI, %
Chronic conditions			
Hypertension	1962	59.8	56.9–62.7
Diabetes	759	24.1	22.1–26.2
Congestive heart failure	176	5.2	4.3–6.4
Stroke	223	6.5	5.4–7.9
Coronary artery disease/myocardial infarction	388	12.6	10.8–14.8
End-stage renal disease	48	1.7	1.2–2.3
Chronic kidney disease	171	5.0	4.0–6.3
Triage pain scale			
No pain	806	23.5	20.8–26.4
1–5	544	16.5	14.6–18.5
6–10	1304	39.2	35.9–42.6
Unknown/missing	663	20.8	16.5–25.9

ED = emergency department; SBP = systolic blood pressure; DBP = diastolic blood pressure.
* Self-pay, charity/no charge.
† Other, Worker's Compensation, unknown, missing.
‡ National Hospital Ambulatory Medical Care Survey includes up to five reasons for visits (RFV) in order of significance. Hypertension is defined as RFV1 = 2510.0.

proximately 4498/75,948 (unweighted) or 5.9% of these visits meet inclusion criteria for aHTN, representing an estimated 33,348,858 visits (weighted). The most common disposition, regardless of reason for visit, was discharge. Approximately, 3317 of 4498 (unweighted) or 74% resulted in discharge representing an estimated 26,467,348 U.S. ED visits (weighted). Of visits found to have aHTN with discharge, 35.5% of patients were older than 65 years and 36.7% were insured by Medicare. Most patients were female (58.8%), non-Hispanic White (62.5%), and resided in a private residence (94.8%). Most visits were evaluated in nonacademic hospitals (88.4%) in the South region (45.5%) and in urban hospitals (81.3%). Only 6% of patients listed HTN as their primary reason for the visit. Of visits found to have aHTN with discharge, there were 58.8% of visits with HTN 160–179/100–109 mm Hg and 41.2% of visits with HTN ≥ 180/110 mm Hg. Most patients had a prior diagnosis of HTN (59.8%); 24.1% of patients had a prior diagnosis of diabetes and 12.6% previously had coronary artery disease (CAD) or myocardial infarction (MI). Fewer than 10% of patients had a prior diagnosis of congestive heart failure (CHF), stroke, end-stage renal disease (ESRD), or chronic kidney disease (CKD). Of the available triage pain scale scores, 23.5% had no pain, 16.5% had a score between 1 and 5, and 39.2% of them had a score between 6 and 10 (Table 1).

Diagnosis and treatment frequencies were evaluated in discharged asymptomatic visits captured in NHAMCS. Among visits with HTN ≥ 180/110 mm Hg, 13.0% (95% CI 10.6–15.8%) were diagnosed with HTN compared with 3.12% (95% CI 2.35–4.14%) in the HTN 160–179/100–109 mm Hg group. More antihypertensives were prescribed in the ED visits with higher HTN group; 16.2% (95% CI 13.7–19.0%) vs. 2.59% (95% CI 1.87–3.60%). There was no significant difference in prescription frequencies at discharge 8.4% (95% CI 5.8–12.0) vs 5.84% (95% CI: 4.56–7.44%) between the HTN groups. However, when both ED and discharge medications were provided, it occurred more often in the higher HTN group (3.9% [95% CI 2.8–5.5%] vs. 1.21% [95% CI 0.74–1.97]) (Table 2).

Discussion

We used data from NHAMCS 2016–2019 survey to examine ED visits for aHTN. To our knowledge, this is the first study to estimate the frequency of aHTN, regardless of the reason for visit, using a nationally representative sample of U.S. ED visits. We estimate that 33.3 million or 5.9% of all ED visits are found to have aHTN. We also estimate that most of these visits, 26.5 million or 74%, result in discharge.

Our careful inclusion and exclusion criteria allow for a more valid estimate of the prevalence of aHTN in U.S. EDs. Mullins et al.'s study estimated that visits with HTN as the primary chief symptom represented 0.6% of all

Table 2. Diagnosis and Treatment Outcomes in Emergency Department Visits for Asymptomatic Hypertension, National Hospital Ambulatory Medical Care Survey 2016–2019.

Outcome	160–179 mm Hg SBP or 100–109 mm Hg DBP		≥ 180 mm Hg SBP or ≥ 110 mm Hg DBP		*p* Value
	Weighted %	95% CI, %	Weighted %	95% CI, %	
Hypertension diagnosis	3.12	2.35–4.14	13.0	10.6–15.8	0.00
Antihypertensive medication					
Given in ED	2.59	1.87–3.60	16.2	13.7–19.0	0.00
Prescribed at discharge	5.84	4.56–7.44	8.4	5.8–12.0	0.06
Both	1.21	0.74–1.97	3.9	2.8–5.5	0.00

DBP = diastolic blood pressure; ED = emergency department; SBP = systolic blood pressure.

ED visits (8). Our estimate is higher because we included visits with aHTN regardless of symptom, to account for patients who may be unaware of their diagnosis. In contrast, Goldberg et al.'s study found that 16% of visits had triage BP ≥ 160/100 mm Hg (9). Our estimate is lower because of our study's exclusion of visits that did not have an additional discharge BP ≥ 160/100 mm Hg and exclusion of visits with symptomatic HTN.

Overall, ED visits for aHTN occurred disproportionally in older, non-Hispanic White, female patients with a prior diagnosis of HTN. Most visits occurred in the South region, which has higher rates of HTN (15). Most visits occurred in urban and nonacademic settings, which supports focusing interventions at these sites. These results are similar to the demographic results in the Goldberg et al. and Mullins et al. studies (8,9). With the exception of CAD/MI (12.6%), < 10% of visits had CHF, stroke, ESRD, or CKD, highlighting the potential to prevent long-term complications of aHTN if patients are made aware their condition.

Despite having 2 elevated BP measurements ≥ 160/100 mm Hg, ED clinicians rarely diagnose aHTN. This is concerning because only 6% of patients had HTN as their primary reason for the ED visit, and highlights potential missed opportunities to increase awareness of aHTN according to current guidelines. Although it is encouraging that diagnosis frequencies increase by 10 percentage points when aHTN is ≥ 180/110 mm Hg, prior studies have shown that ED HTN ≥ 160/100 mm Hg is associated with a definitive diagnosis of HTN at follow-up (16,17). Regarding treatment, ACEP guidelines recognize the potential to cause harm from rapidly lowering aHTN and support initiating treatment for aHTN ≥ 160/110 mm Hg only when the risks outweigh the benefits in selected social or clinical situations, such as patients who are older, Black, have limited access to care, or poor follow-up. In our sample of mostly non-Hispanic White and insured patients, ED clinicians follow guidelines and rarely initiate treatment. Although this study was not designed to assess factors associated with treatment, other studies have found differences in treatment rates across demographic groups. For example, Goldberg et al.'s study found that diagnosis and treatment rates were higher in non-Hispanic, Black, and uninsured patients, which may indicate a preference to follow guidelines (9).

A common reason for infrequent diagnosis and treatment of aHTN is attribution of aHTN to pain (18). In our study, two-thirds of the available triage pain scores were either 0 or between 1 and 5. Studies have shown that, regardless of pain, aHTN in the ED persists after discharge and should not be ignored, especially if elevated at discharge, when pain would have presumably been treated (16,17).

Limitations

A limitation of this cross-sectional study is the inability to evaluate long-term outcomes, including what the impact of treatment or lack thereof is on diseases associated with aHTN. Similarly, the lack of encounter linkage to other health care visits prevents our ability to understand whether aHTN persisted beyond the ED or whether aHTN was addressed in another context. Nonetheless, our goal was to understand the unique snapshot of aHTN in the ED as a starting point for future investigation into diagnosis and management of patients. In addition, missing survey variables may contribute to selection bias. Missing sex, race, and ethnicity variables were imputed by survey administrators on the basis of a validated algorithm (11). This study was not designed to input the missing pain scale values and we are unable to account for pain scale values at discharge, which could affect diagnosis and treatment outcomes. Other factors that could impact diagnosis and treatment rates, such as the presence of a

primary care doctor, and results from electrocardiograms, chest x-ray studies, or renal studies are unavailable. In this study, aHTN diagnosis variable is limited to ICD-10 codes. Outside of ICD-10 diagnosis documentation, we do not know whether the diagnosis of aHTN was given verbally, via discharge instructions, or through a visit note. Lastly, NHAMCS does not provide the route of medication administration or whether the patient filled the prescription.

Conclusions

There are 26.5 million adults with aHTN discharged home from the ED and most of them leave without diagnosis or treatment. Although current guidelines do not support routine treatment of aHTN in the ED, opportunities to diagnose and increase awareness of all patients should not be missed. The results of this study provide a process to better estimate ED visits for aHTN and emphasize the need to increase diagnosis of aHTN in ED patients.

Declaration of competing interest

None.

CRediT authorship contribution statement

Adesuwa Akhetuamhen: Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Kristin Bibbins-Domingo:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Jahan Fahimi:** Writing – review & editing, Software, Methodology, Formal analysis, Conceptualization. **Valy Fontil:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Robert Rodriguez:** Writing – review & editing, Methodology, Conceptualization.

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Supplementary Materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jemermed.2024.01.006.

Appendix: ICD-10 Codes Used to Identify Symptomatic Hypertension

- ICD-10 code key was requested from NHAMCS analyst on March 23, 2022 (12)
- Acute kidney failure N179, N17
- End stage renal disease N186 unspecified kidney failure, including uremia NOS N19
- Hypertensive chronic kidney disease with stage 5 chronic kidney disease or ESRD I120
- Acute myocardial infarction AMI I214, I213, I211, I21 and acute myocardial infarction, unspecified I219
- Other acute and subacute ischemic heart disease I249
- Cardiac arrest and ventricular fibrillation I469
- Cardiac dysrhythmias, excluding ventricular fibrillation I469, I489, I471, I480, I499, I482, I481, I491, I498, I472, I495
- Cerebrovascular disease I639, I619, I63, I629, I635, I693, I609, I60, I61, I620, I62, I633, I634, I65, I67
- Transient cerebral ischemic attacks and related syndromes G459, G45
- Cocaine related disorders F14, F141, F149, F142
- Coronary atherosclerosis and other chronic ischemic heart disease (with angina pectoris) I251, I25, I255, I259
- Early or threatened labor O479, O60, O600, O47, O470, O471
- Heart failure, non-hypertensive I509, I502, I504, I503, I50
- Hypertensive heart disease with heart failure I110
- Hypertensive heart and chronic kidney disease with heart failure and stage 1 through 4 chronic kidney disease or unspecified chronic kidney disease I130, I13
- Hypertensive heart and chronic kidney disease with heart failure with stage 5 chronic kidney disease or end stage renal disease I132
- Other complications of pregnancy O200, O268, O998, O99, O996, O995, O234, O26, O469, O210, O80, O133, O14, O209, O21, O219, O23, O429, O16, O208, O72, O109, O211, O269, O34, O44, O48, O622, O629, O86, O993, O08, O13, O139, O169, O218, O231, O289, O309, O341, O348, O36, O368, O369, O90, O98, O990
- Supervision of high-risk pregnancy O09, O095, O098
- Pregnancy, childbirth, and the puerperium O00
- Other pregnancy with abortive outcome O039, O009, O034, O029, O03
- Missed abortion O02 O021

- Other encounter related to pregnancy, excluding incidental pregnancy Z320, Z3A1, Z3A2, Z3A3, Z3A4
- Encounter for supervision of normal Pregnancy Z348, Z349, Z340
- Respiratory failure J960 J962 J969 J96
- Hypertensive emergency I161
- Trauma/injury defined using NHAMCS category called injury "is this visit related to injury/trauma, overdose/poisoning, or adverse effects of medical or surgical treatment?" (11). The ICD-10 codes include "diagnosis codes in the 'S' or 'T' chapters of ICD-10-CM, diagnosis codes for complications of medical or surgical care (located throughout the ICD-10-CM; a list of codes is available by contacting the Ambulatory and Hospital Care Statistics Branch (AHCSB) at 301-458-4600 or email ambcare@cdc.gov; and cause of injury codes in the 'V', 'W', 'X' and 'Y' chapters of ICD-10-CM" (11).

References

1. Carey RM, Moran AE, PK Whelton. Treatment of hypertension: a review. JAMA 2022;328:1849–61.
2. Virani SS, Alonso A, Benjamin EJ, et al. Heart disease and stroke statistics—2020 update: a report from the American Heart Association. Circulation 2020;141:e139–596. doi:10.1161/CIR.0000000000000757.
3. Patel SA, Winkel M, Ali MK, et al. Cardiovascular mortality associated with 5 leading risk factors: national and state preventable fractions estimated from survey data. Ann Intern Med 2015;163:245–53.
4. Lewington S, Clarke R, Qizilbash N, et al. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. Lancet 2002;360(9349):1903–13.
5. McNaughton CD, Self WH, Zhu Y, et al. Incidence of hypertension-related emergency department visits in the United States, 2006–2012. Am J Cardiol 2015;116:1717–23.
6. Miller J, McNaughton C, Joyce K, et al. Hypertension management in emergency departments. Am J Hypertens 2020;33:927–34.
7. Wolf SJ, Lo B, Shih RD, et al. Clinical policy: critical issues in the evaluation and management of adult patients in the emergency department with asymptomatic elevated blood pressure. Ann Emerg Med 2013;62:59–68.
8. Mullins PM, Levy PD, Mazer-Amirshahi M, et al. National trends in U.S. emergency department visits for chief complaint of hypertension (2006–15). Am J Emerg Med 2020;38:1652–7.
9. Goldberg EM, Marks SJ, Merchant RC. National trends in the emergency department management of adult patients with elevated blood pressure from 2005 to 2015. J Am Soc Hypertens 2018;12:858–66.
10. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Hypertension 2018;71(6):e13–115.
11. National Ambulatory Medical Care Survey: 2016-2019 NHAMCS microdata file documentation. National Center for Health Statistics. Centers for Disease Control and Prevention January 27, 2024. Accessed https://www.cdc.gov/nchs/ahcd/datasets_documentation_related.htm.
12. International Classification of Diseases, Tenth Revision (ICD-10). Centers for Disease Control and Prevention January 26, 2024. Accessed https://www.cdc.gov/nchs/icd/icd10.htm.
13. International Classification of Diseases, Ninth Revision. Clinical Modification (ICD-9-CM). Centers for Disease Control and Prevention. Accessed January 27, 2024 https://www.cdc.gov/nchs/icd/icd9cm.htm.
14. Ambulatory care drug database. Centers for Disease Control and Prevention. Accessed July 8, 2022 https://www2.cdc.gov/drugs/applicationnav1.asp.
15. Facts about hypertension. Centers for Disease Control and Prevention. Accessed December 8, 2022 https://www.cdc.gov/bloodpressure/facts.htm.
16. Poon SJ, Roumie CL, O'Shea CJ, et al. Association of elevated blood pressure in the emergency department with chronically elevated blood pressure. J Am Heart Assoc 2020;9(12). doi:10.1161/JAHA.119.015985.
17. Tanabe P, Persell SD, Adams JG, McCormick JC, Martinovich Z, Baker DW. Increased blood pressure in the emergency department: pain, anxiety, or undiagnosed hypertension? Ann Emerg Med 2008;51:221–9.
18. Brody AM, Sharma VK, Singh A, et al. Barriers to emergency physician diagnosis and treatment of uncontrolled chronic hypertension. Am J Emerg Med 2016;34:2241–2.

Article Summary

1. Why is this topic important?

Only 44% of U.S. adults with hypertension (HTN) are controlled. The emergency department (ED) could be uniquely leveraged to improve HTN control through increased awareness of asymptomatic hypertension (aHTN).

2. What does this study attempt to show?

The purpose of this study was to provide a process to better estimate the number of U.S. ED visits with asymptomatic hypertension.

3. What are the key findings?

Despite having two aHTN measurements $\geq$ 160/100 mm Hg (including one measured at discharge), millions of adults with aHTN were discharged home from the ED without diagnosis. Although current guidelines do not support routine treatment of aHTN in the ED, opportunities to diagnose and increase awareness of all patients should not be missed.

4. How is patient care impacted?

This report highlights missed opportunities to diagnose poorly controlled aHTN in the ED setting. The report also raises future questions about how to accurately measure and could inform future clinical guidelines for aHTN.