Original Paper: CME

Hypertension Treatment in the Ambulatory Setting: Comparison by Race and Gender in a National Survey

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To determine if different therapies are used in different racial groups and by gender, data from the National Ambulatory Medical Care Survey and the National Hospital Ambulatory Care Survey (national probability samples of outpatient visits) were used. All visits for hypertension in 1999 and 2000 were reviewed. Survey weights were applied to obtain national estimates. Provision of therapies by gender and race/ethnicity (white, African American, Hispanic, Asian) was examined. Over 137 million visits for hypertension care were made during 1999 and 2000. Diet and exercise counseling were performed at a low percentage of visits (35% and 26% of visits, respectively). The most common antihypertensive agent prescribed was angiotensin-converting enzyme inhibitors or angiotensin-receptor blockers (28%), while first-line drugs, diuretics (23%) and β blockers (15%), which are recommended by national committees, were prescribed less frequently. Asians and Hispanics were more likely to receive counseling on diet (Asians: odds ratio [OR], 2.29; 95% confidence interval [CI], 1.45–3.60; Hispanics: OR, 2.51; 95% CI, 1.18–5.33) and exercise (Asians: OR, 2.44; 95% CI, 1.35–4.42; Hispanics: OR, 3.28; 95% CI, 1.50–7.21) than non-Hispanic whites. African Americans were more likely to be prescribed calcium channel blockers (OR, 1.51; 95% CI, 1.20–1.91) and diuretics (OR, 1.37; 95% CI, 1.08–1.74). Low use of recommended therapies was found. Although variation by race was seen, it did not systematically favor groups associated with poor outcomes.
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Hypertension is a common disease, affecting 24% of the population in the United States, and is associated with higher risk of coronary artery disease, cerebrovascular disease, and kidney disease.[1] Many of these complications can be prevented with appropriate control of blood pressure. Despite multiple therapies available, many individuals remain inadequately treated[2] and thus at risk for further complications. Hypertension remains one of the leading causes of preventable hospitalizations.[3]

Individuals from minority racial groups are disproportionately affected by hypertension. A higher percentage of African Americans have hypertension,[4] and more Hispanics have uncontrolled hypertension.[2] The mortality rate from hypertension and hypertensive kidney disease for African Americans is nearly three times the rate for non-Hispanic white patients.[5] Hypertension accounts for the largest number of potential life-years lost in African Americans.[6] The cause of these disparities is unclear but may include lower levels of physical activity,[7] biological differences,[8,9] physician behaviors,[10,11] and socioeconomic characteristics.[12] Few studies have compared care in the outpatient setting, where most hypertension treatment occurs, and most have been limited in the racial groups compared. Our aim was to examine national patterns of treatment for hypertension

Table I. Description of Sample‡‡

	%	N (MILLIONS)
Patients with hypertension as any diagnosis	…	137.4
National Ambulatory Medical Care Survey participants	90	124.2
Patients with hypertension as primary diagnosis	53	73.4
Patients with hypertension and no additional diagnosis	15	21.2
Patients with hypertension and one additional diagnosis	31	43.2
Patients with hypertension and two additional diagnoses	53	73.1
Female gender	58	80.2
Race/ethnicity		
White	69	95.2
Black/African American	17	23.4
Hispanic	8	11.2
Asian/Pacific Islander	6	7.6
Hypertension-related comorbidities*		
Diabetes**	18	24.1
Hyperlipidemia***	8	11.3
Coronary artery disease†	8	10.4
Congestive heart failure††	2	2.3
Insurance status		
Private	42	57.5
Medicare	40	55.4
Medicaid	7	9.0
Self pay	3	4.7
Other‡	8	10.7
Type of visit		
Acute	20	27.4
Chronic, routine	53	73.5
Chronic, flare	8	10.4
Nonillness care	19	26.1

*Nephropathy, peripheral vascular disease, and cerebral vascular disease were listed <1% of the time; **International Classification of Diseases, ninth revision (ICD-9) codes: 401.1, 401.1, 401.9; ***ICD-9 codes: 272.1–272.9; †ICD-9 codes: 411.1, 411.81, 411.89, 412, 413.0, 413.1, 413.9, 414.00–414.05; ††ICD-9 codes: 428.0, 428.1, 428.9 402.01, 402.11, 402.91; ‡combination of the answers no charge, workers' comp, and unknown; ‡‡mean age 63 years

in the outpatient setting, and to compare treatment by gender and race.

METHODS

Data Source

The National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS) are federally administered surveys of ambulatory medical care in the United States.[13,14] The NAMCS is a probability sample of visits to community based, nonfederally employed physicians engaged in office-based patient care.[13] The NHAMCS is a national probability sample of emergency department and outpatient departments of short stay, medical, surgical, or children's general hospitals listed in the 1991 SMG Hospital Market database.[14] Both surveys were designed to provide an overview of medical care in the ambulatory setting. Full details of the study design and sampling frame have been published.[13,14] Briefly, the sampling unit in both surveys is the patient-physician encounter or visit. Physicians (NAMCS) or outpatient departments (NHAMCS) are randomly selected, and patient visits to the provider or clinic are randomly selected for data collection. The instruments used in each survey are similar and vary little by year.[15,16] They include questions on demographics, insurance, diagnostic and therapeutic services, medication, and physician and clinic characteristics. Up to three diagnoses may be listed; a primary diagnosis and two other diagnoses related to the visit or to the choice of treatment.

STUDY POPULATION

To establish our study population we selected records of individuals over the age of 18 years with a diagnosis of hypertension. The sample population was characterized by age, gender, race/ethnicity (white, African American, Asian/Pacific Islander, and Hispanic), insurance status (private, Medicare, Medicaid, self-pay, and no charge/worker's comp/unknown), and type of visit (acute; chronic, routine; chronic, flare; and nonillness care). We also examined comorbidities associated with hypertension (diabetes, hyperlipidemia, coronary artery disease, nephropathy/renal failure, congestive heart failure, peripheral vascular disease, and cerebral vascular disease).

Patterns of Treatment and Comparison by Gender and Race/Ethnicity

The Joint National Committees on Prevention, Detection, Evaluation and Treatment of High Blood Pressure have repeatedly recommended lifestyle modifications as therapy for hypertension.[17,18] Both the NAMCS and the NHAMCS track 18 therapeutic services provided or ordered at the visit. Two types of lifestyle therapy for hypertension were examined: diet/nutrition and exercise counseling.

Medication patterns were also examined. Both the NAMCS and NHAMCS allow for up to six medications to be listed.[15,16] Both surveys list medication by the individual drug name. To determine drug use,

we searched the dataset for the individual drug codes (generic and brand) of all drugs within the classes of medication of interest. We determined the percentage of the population that received medications within specific classes of antihypertensive medications: angiotensin-converting enzyme (ACE) inhibitor or angiotensin-receptor blocker (ARB), β blocker, calcium channel blocker (CCB), diuretic, and other. Treatment with specific combinations (diuretic plus β blocker, diuretic plus ACE inhibitor/ARB, diuretic plus CCB, β blocker plus ACE inhibitor/ARB, β blocker plus CCB, ACE inhibitor/ARB plus CCB) was also examined. Finally, we reviewed the intensity of treatment by calculating the number of antihypertensive medications an individual was receiving (zero, one, two, three or more). We then compared treatment by gender and race/ethnicity to determine if systematic variation exists. Four different comparisons of treatment were made: male/female; African American/white; Hispanic/white; Asian/white. Each treatment category was compared after national sampling weight had been applied.

Statistical Analysis

Analyses were performed using STATA version 7.0 (1999, StataCorp. College Station, TX). Population averages for all demographic characteristics and treatments were determined using the survey set of commands in STATA. These commands account for the sampling design and individual weighting of survey data. The adjusted effect of gender and race/ethnicity was examined using survey logistic regression models. Specifically, we modeled the odds of receiving various medications and nonpharmacologic treatment as a function of gender or race/ethnicity after adjusting for age; gender (race/ethnicity comparison only); race/ethnicity (gender comparisons only); insurance; type of visit; and the comorbidities of diabetes, hyperlipidemia, and coronary artery disease. Intensity of treatment was compared using the survey command for ordered logistic regression with adjustment for the factors noted above and is reported as *p* values.

Table II. Treatment Patterns

	%	N (millions)
Nonpharmacologic therapies		
Diet/nutrition counseling	35	48.5
Exercise counseling	26	35.3
No. of antihypertensive medications		
None	36	49.8
One	36	49.7
Two	19	26.1
Three or more	9	11.8
Use of medication by antihypertensive class*		
ACE/ARB	28	38.7
β Blocker	15	20.8
CCB	23	32.0
Diuretic	23	31.6
Other	9	12.7
Use by antihypertensive class combinations**		
Diuretic plus β blocker	20	7.8
Diuretic plus ACE/ARB	36	13.7
Diuretic plus CCB	22	8.5
β Blocker plus ACE/ARB	12	4.3
β Blocker plus CCB	13	5.0
ACE/ARB plus CCB	25	9.3

ACE=angiotensin-converting enzyme inhibitor; ARB=angiotensin-receptor blocker; CCB=calcium channel blocker; *people on any antihypertensive medication (percents do not add up to 100 due to use of multiple medications by a single individual); **people on two or more medications

RESULTS

There were 137.4 million outpatient visits with a diagnosis of hypertension in the United States in 1999 and 2000 (Table I). Ninety percent of the visits occurred in freestanding physician offices or clinics while 10% of visits were in hospital outpatient clinics. Hypertension was the primary diagnosis in 53% of visits, and the sole diagnosis in 15%. The mean age of patients was 63±0.5 years with 58% female, and 69% white, 17% African American, 8% Hispanic, and 6% Asian. Diabetes (18% of visits) was the most common comorbidity with other comorbidities including hyperlipidemia (8%), coronary artery disease (8%), and congestive heart failure (2%). Forty-two percent of the visits were by individuals with private insurance, 40% had Medicare, and 3% were self-pay.

Nonpharmacologic therapy was infrequently recommended. Only 35% of visits recommended diet/nutrition modification and only 26% of visits recommended exercise counseling (Table II). In comparison, 64% of visits resulted in the prescription of antihypertensive medication. The most common class prescribed was an ACE inhibitor or an ARB (28%) followed by CCB (23%) and diuretics (23%). Beta blockers were given 15% of the time. When we examined medication classes for those receiving only one antihypertensive medication, we found that an ACE inhibitor or an ARB was again

Table III. Gender and Race Comparisons of Nonpharmacologic and Pharmacologic Therapy

	Male/Female OR* (95% CI)	African American/White OR* (95% CI)	Hispanic/White OR* (95% CI)	Asian/White OR* (95% CI)
Nonpharmacologic therapy				
Diet/nutrition counseling	0.97 (0.82–1.14)	1.31 (0.94–1.83)	2.51 (1.18–5.33)†	2.29 (1.45–3.60)†
Exercise counseling	0.95 (0.79–1.14)	1.04 (0.74–1.45)	3.28 (1.50–7.21)†	2.44 (1.35–4.42)†
Antihypertension medication usage				
Any	1.01 (0.81–1.25)	1.14 (0.90–1.46)	0.70 (0.54–1.09)	1.26 (0.89–1.77)
ACE/ARB	1.08 (0.87–1.34)	0.79 (0.60–1.03)	0.65 (0.40–1.06)	0.74 (0.53–1.02)
β Blocker	0.99 (0.76–1.30)	0.86 (0.59–1.25)	0.74 (0.47–1.16)	1.42 (0.76–2.67)
CCB	1.06 (0.86–1.30)	1.51 (1.20–1.91)†	1.04 (0.69–1.57)	1.19 (0.87–1.62)
Diuretic	0.76 (0.61–0.94)†	1.37 (1.08–1.74)†	0.64 (0.35–1.17)	0.55 (0.24–1.23)
Other	1.84 (1.25–2.72)†	1.48 (1.06–2.07)†	1.07 (0.61–1.87)	0.43 (0.18–1.04)
Hypertension combinations				
Diuretic plus β blocker	0.87 (0.58–1.29)	0.89 (0.50–1.57)	0.34 (0.15–0.76)†	0.78 (0.48–1.27)
Diuretic plus ACE/ARB	0.87 (0.64–1.18)	1.14 (0.84–1.54)	0.72 (0.43–1.19)	0.32 (0.13–0.79)†
Diuretic plus CCB	1.1 (0.80–1.51)	1.75 (1.20–2.56)†	0.87 (0.42–1.78)	0.12 (0.04–0.40)†
β Blocker plus ACE/ARB	1.52 (0.96–2.41)	0.97 (0.52–1.82)	0.57 (0.24–1.40)	0.76 (0.37–1.53)
β Blocker plus CCB	1.27 (0.87–1.86)	1.39 (0.75–2.57)	0.56 (0.23–1.37)	0.14 (0.04–0.51)†
ACE/ARB plus CCB	1.17 (0.88–1.55)	1.69 (1.22–2.32)†	1.06 (0.60–1.89)	0.68 (0.36–1.25)
Intensity of pharmacologic therapy**	NS (p=0.80)	NS (p=0.13)	NS (p=0.12)	NS (p=0.16)

CI=confidence interval; ACE=angiotensin-converting enzyme inhibitor; ARB=angiotensin-receptor blocker; CCB=calcium channel blocker; NS=not significant; *odds ratio (OR) of patients in one group receiving form of therapy or advice compared with the other group, for example, more African Americans, Hispanics, or Asians receive diet/nutrition counseling than whites (OR >1.00); **as measured by the number of hypertensive medications (zero, one, two, or three or more); †statistically significant

the most common class (32%) followed by a CCB (27%) and β blocker (17%). Diuretics were the single agent only 14% of the time. The most common multidrug therapy was a diuretic plus an ACE inhibitor or an ARB (36%) followed by an ACE inhibitor or an ARB plus a CCB (25%), diuretic plus CCB (22%), and a diuretic plus β blocker (20%).

Our comparisons by gender and race/ethnicity (Table III) showed few differences. Both Hispanics and Asians were significantly more likely to receive diet/nutrition counseling (Hispanics: odds ratio [OR], 2.51; 95% confidence interval [CI] β blocker, 1.18–5.33; Asians: OR, 2.29; 95% CI, 1.45–3.60) and exercise counseling (Hispanics: OR, 3.28; 95% CI, 1.50–7.21; Asians: OR, 2.44; 95% CI, 1.35–4.42) than white patients. African Americans were more likely to receive CCBs (OR 1.51; 95% CI 1.20–1.91), diuretics (OR 1.37; 95% CI, 1.08–1.74), and other agents (primarily α blockers: OR, 1.48; 95% CI, 1.06–2.07) than white patients. Men received fewer diuretic agents (OR, 0.76; 95% CI, 0.61–0.94) but more drugs classified as other (OR, 1.84; 95% CI, 1.25–2.72). When combinations were compared, African Americans were more likely than whites to be on combinations involving CCB (diuretic plus CCB: OR, 1.75; 95% CI, 1.20–2.56; ACE inhibitor/ARB

plus CCB: OR, 1.69; 95% CI, 1.22–2.32). Asians were less likely to be on combination therapy (diuretic plus ACE inhibitor/ARB: OR, 0.32; 95% CI, 0.13–0.79; diuretic plus CCB: OR, 0.12; 95% CI, 0.04–0.40; β blocker plus CCB: OR, 0.14; 95% CI, 0.04–0.51). Our final comparison of treatment intensity found no significant differences by gender or race.

DISCUSSION

More than 137 million visits in the United States in 1999 and 2000 were associated with a diagnosis of hypertension. Our study describes patient characteristics and treatment patterns. More visits were made by women than men; most visits were for chronic, routine, or nonillness care; and most visits were by patients with insurance. We found low utilization of diet/nutrition and exercise counseling, and relatively low use of medication classes such as diuretics and β blockers recommended as initial therapy by US national committees. When therapy was compared by gender and race/ethnicity, Asians were more than twice as likely to receive counseling on diet/nutrition and exercise when compared with white patients. Hispanic patients were also more than twice as likely to receive nutrition counseling and more than three times as likely to receive exercise counseling. Few medication differences were seen. African Americans received CCBs more often and more combinations involving CCB and Asians were less likely to be on combination therapy. Men were more often on other agents and less likely to be on a diuretic.

The low use of nonpharmacologic therapies is troubling. Lifestyle counseling is indicated for all stages of elevated blood pressure[17,18] and previous research has shown that those patients who report using lifestyle modifications were more likely to have controlled hypertension.[2] Previous research has shown that frequent reinforcement improves adherence to recommended lifestyle changes.[19] The sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI),[17] guidelines available at the time of these surveys, recommends at least biannual visits for the follow-up of hypertension, providing two opportunities a year to reinforce lifestyle changes. Assuming physicians counsel or reinforce changes at least once a year, we would expect to see rates nearer 50% in this cross-sectional survey. The low overall rates (dietary 35%, exercise 26%) suggest that these therapies are currently underutilized. It is encouraging that the rates for two minority groups, Asians and Hispanics, are considerably higher than that for whites, suggesting that, although there is low overall use, there is no racial bias.

The variation in medications is more easily accounted for, particular the high use of CCB and diuretics among the visits by African-American patients. JNC VI[17] and clinical trials[20] suggest that these medications may be more effective in African Americans than other medication classes. More troubling is the relatively low usage of β blockers and diuretics overall. Only 15% of the prescriptions were written for β blockers and only 23% for diuretics compared with 28% for ACE inhibitors. When visits with single agents were examined, the percent on diuretics decreases to 14%. While JNC VI does state that ACE inhibitors may be first-line therapy if there are compelling indications, either a diuretic or a β blocker is recommended as initial therapy for uncomplicated hypertension. JNC 7[18] has recommended that a diuretic should be first-line therapy in most cases unless there is a specific or compelling reason to use a different medication. Only 18% of our population had diabetes as a comorbidity and only 2% had congestive heart failure, two of the JNC VI compelling indications for use of ACE inhibitors. While an ACE inhibitor may represent first- or second-line therapy, depending on comorbidity, the percentage of use in this survey suggests that these agents are not being used appropriately.

There are several strengths to this study. This is a national survey and includes visits to both private physicians and hospital clinics. The national scope and large sample size allow us to compare both gender and racial groups. This study was, however, limited by its cross-sectional design and lack of clinical outcomes. Additionally, this survey was completed by physicians. It does not contain information on the ability of the patient to obtain medication or their adherence to therapies. Despite these limitations, our study is one of the most comprehensive analyses of hypertension treatment in the outpatient setting for patients.

Hypertension is a serious public health problem. Compliance with evidence-based guidelines such as JNC 7 can reduce the morbidity and mortality associated with this disease. The low rates of use of first-line therapies such as lifestyle changes and diuretics and β blockers indicate poor compliance with guidelines and supports the finding of other studies.[21,22] Increased use of these widely accepted guidelines is needed to improve the quality of medical care and more research is needed on methods to enhance compliance. Importantly, although we found low rates overall, we found little systematic variation by gender or race/ethnicity. Previous studies using hypothetical cases have suggested that systematic variation by race may be contributing to the disparities seen.[23] Our results indicated that, at least for treatment of

hypertension, this is not the case. Reducing variation in patient care and medical outcomes remains an important goal. Given the lack of variation in prescribing practices seen here, research should focus on other possible causes of disparities such as poor access to care and inability to purchase medications.

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CME Questions

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INSTRUCTIONS FOR COMPLETING THIS FORM: Read the selected paper and answer all the questions that follow. After each question there is a series of possibly correct answers. Please select the one best answer for each and place your selection on the answer grid. **YOU MUST ALSO COMPLETE THE CME EVALUATION SECTION** and return the form within 6 months of the paper's publication to receive credit. Letters of credit will be mailed to participants biannually.

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OBJECTIVE AND TARGET AUDIENCE: All primary care physicians and cardiologists are eligible to receive credit. At the conclusion of this activity, participants should be able to: 1) summarize the important points discussed in the paper reviewed; 2) identify patients to whom the paper is relevant; 3) modify management practices as new information is learned; and 4) identify deficiencies in their knowledge base.

Please Select the One Best Answer for Each and Place Your Selection on the Answer Grid.

1. Sites included in this study included all of the following except:
   A __ Outpatient physician offices
   B __ Emergency departments
   C __ Short stay units
   D __ Veterans Affairs outpatient clinics

2. What percent of patients in this study received counseling regarding dietary and lifestyle modifications?
   A __ 10%
   B __ 25%
   C __ 35%
   D __ 50%

3. The most common comorbidity seen with outpatient hypertension visits was:
   A __ Congestive heart failure
   B __ Coronary artery disease
   C __ Diabetes
   D __ Hyperlipidemia

4. Which of the following medications was most commonly prescribed as monotherapy in this study?
   A __ Angiotensin-converting enzyme inhibitors/ angiotensin-receptor blockers
   B __ Calcium channel blockers
   C __ Beta blockers
   D __ Diuretics

5. In this study, who was most likely to receive counseling on lifestyle modifications?
   A __ African Americans
   B __ Hispanics
   C __ Whites
   D __ None of these

CME Answers are available on *The Journal of Clinical Hypertension* page at www.lejacq.com

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