

**Determinants of Racial/Ethnic Differences in Blood Pressure Management Among
Hypertensive Patients**

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Abstract

Background: Few data are available regarding the mediators of racial/ethnic disparities in the intensity of hypertension treatment.

Methods: We reviewed the medical records of 1,205 patients who had a minimum of two hypertension-related outpatient visits to 12 general internal medicine clinics during 7/1/01-6/30/02. Using logistic regression, we determined the odds of having therapy intensified by patient race/ethnicity after adjustment for clinical characteristics.

Results: Blacks (81.9%) and Whites (80.3%) were more likely than Latinos (71.5%) to have therapy intensified ($P=0.04$). After adjustment for racial differences in the number of outpatient visits and presence of diabetes, there were no racial differences in rates of intensification.

Conclusions: We found that racial/ethnic differences in therapy intensification were largely accounted for by differences in frequency of clinic visits and in the prevalence of diabetes. Interventions to reduce disparities in cardiovascular outcomes should increase physician awareness of the need to intensify drug therapy more aggressively in patients without waiting for multiple clinic visits, and should remind providers to treat hypertension more aggressively among diabetic patients.

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Background

Hypertension is among the most prevalent chronic diseases in the United States.¹ Despite the availability of effective medications and well-published guidelines for the treatment of hypertension,^{1,2-4} the majority (approximately 75%) of hypertension in the United States remains poorly controlled.⁵

Hypertension is particularly burdensome among racial/ethnic minority groups and hypertension-related cardiovascular disease has been shown to be the greatest contributor to previously documented racial differences in mortality.⁶⁻⁸ Although higher rates of hypertension control and a reduction in racial differences in outcomes from hypertension may be obtained by increasing providers' aggressiveness in intensifying therapy when indicated,^{2,9} several studies have demonstrated that providers often allow their patients to remain poorly controlled.¹⁰⁻¹¹

We previously examined the association of patients' race/ethnicity with processes of hypertension care.⁹ We found that, among a cohort of hypertension patients with repeatedly elevated blood pressures, Hispanics were significantly less likely to have therapy intensified and were more likely to have uncontrolled blood pressure (BP) than were other racial and ethnic groups. In an effort to identify potential targets for interventions to improve hypertension care among our patients, we further examined which patient and provider characteristics may explain racial differences in rates of therapy intensification.

Methods

Study Sample and Procedures

To determine which patient-centered characteristics are associated with providers intensifying drug therapy for hypertension and whether provider experience is related to differences in intensification of therapy, we studied a random subset of 1,205 patients who had a minimum of two hypertension-related outpatient visits to one of twelve general medicine clinics in community health centers and community practices affiliated with a large urban academic medical center from July 1, 2001 through June 30, 2002 (totaling 3,257 visits). To determine hypertension-related visits, we reviewed the electronic medical record (EMR) for all clinic visits with a primary or secondary diagnostic code of hypertension (HTN) (ICD-9 401- 401.9, 405- 405.99). The study protocol was approved by the Human Studies Committee at the Brigham and Women's Hospital.

Medical Record and Administrative Data

Trained abstracters reviewed the EMR of each hypertension-related visit, collecting: patient race/ethnicity, patient age at time of initial visit, sex, primary insurer at time of initial visit, presence of comorbid disease (diabetes, congestive heart failure (CHF), coronary artery disease (CAD), or renal failure) listed on the patient problem list, and any changes made to antihypertensive drug therapy during visit (decrease or discontinuation of drug, change to another class of drug, or increase of drug dose or addition of new drug).

From the medical center's administrative database, we abstracted each provider's level of experience (intern, resident, or attending). Patient zip code was also obtained

and linked to 2000 U.S. Census data to obtain the median annual household income in each patient's zip code.

Intensity of Therapy

Our methods for identifying intensified cases among our cohort have been previously described.⁹ We classified each visit into two categories, intensified visits (an increase in intensity of drug therapy) versus non-intensified visits (a decrease or no change in intensity of drug therapy) according to previously defined changes in medications.² We developed an algorithm to determine whether a patient received at least one increase in drug therapy (an increase in drug dose or addition of new medication) in response to a repeatedly elevated BP during the study period (Figure 1). Each patient with fewer than two visits with an elevated BP (N=356) or for whom we could not determine their racial/ethnic classification (N=67) was excluded from the algorithm. Each patient with an uncontrolled BP at more than one visit was identified as either an intensified case (at least one drug increase) or a non-intensified case (no drug increases). Each reviewer examined a subset of 30 records; we then tested for inter-rater reliability and found excellent agreement among reviewers (kappa=0.90).

Data Analysis

We compared patients' demographic, clinical, and provider's characteristics by patient race/ethnicity (Table 1) using chi-squared tests for categorical and Student's t-test for continuous variables. We also estimated the association of being an intensified case with patients' demographic, clinical, and provider's characteristics (Table 2). We report two-tailed P values with statistical significance set at $P \leq 0.05$ for all analyses.

Using forward selection, we built a logistic regression model adjusting for measured confounders, we then assessed whether race/ethnicity was associated with intensification of therapy. Data were available on every variable for 710 of the 782 patients (90.8%) for multivariable analyses. We report adjusted odds ratios with 95% confidence intervals for the intensified cases. In secondary analyses, we included interaction terms for patient race/ethnicity and provider experience level to determine whether racial/ethnic differences in intensification differed by provider experience level. All non-significant interaction terms were removed from the final model. All models were estimated using SUDAAN statistical software to adjust for within clinic correlation of visits.¹²

Results

Patient, Clinical, and Provider Characteristics

Of the 782 patients, 304 (39%) were White, 309 (40%) were Black, 144 (18%) were Hispanic, and 25 (3%) were classified as other (Table 1). The majority of patients in our cohort were women (72%) and most were either privately insured or had Medicare (70%). During the 1-year study period, 76% of patients had three or fewer visits. There were 172 (22%) patients in our cohort with diabetes. We were able to determine the primary provider for 716 patients, of who 45 (6.3%) received care from an intern, 92 (12.8%) received care from a resident, and 579 (80.9%) received care from an attending. Demographic and clinical differences between patients' racial/ethnic groups are presented in Table 1.

Intensification of therapy

Of the 782 patients with multiple visits whose BP was uncontrolled at two or more visits, there were 617 (78.9%) who had their medications intensified. Hispanic and other patients were significantly less likely to have their medications intensified than White and Black patients (Table 2). Diabetic patients and those with three or fewer visits during the study periods were also less likely to have their medications intensified.

After adjustment for age, insurance status, number of hypertension-related visits, diabetes, and physician experience, patients classified as “other” remained less likely to have their therapy intensified compared to Whites (Table 3). Patients with diabetes were significantly less likely to have their therapy intensified compared to those without diabetes. Compared to patients aged >70 years, younger patients were more likely to have their therapy intensified, and patients with >3 visits were more likely than those with ≤ 3 visits to have their therapy intensified. There were no significant interactions between race/ethnicity and provider experience in the multivariate model.

Discussion

In this population, we found that racial/ethnic disparities in rates of antihypertensive therapy intensification may be due to differences in visit patterns among patients and in physicians’ aggressiveness in managing BP in diabetic patients. In our prior work, we found that appropriate intensification of anti-hypertensive therapy was associated with subsequent BP control for all racial/ethnic groups, suggesting that that equal treatment in terms of aggressiveness of drug therapy should reduce disparities in hypertension outcomes.⁹

There is substantial literature, however, that suggests that racial/ethnic minority groups are less likely to have their therapy appropriately intensified.¹³⁻¹⁴ However, these

studies were limited because the investigators were not able to assess practice patterns such as the frequency with which individual anti-hypertensive drugs were intensified in response to uncontrolled BP. We found that Hispanic patients in our cohort were also less likely to have their anti-hypertensive medications intensified at least once in response to repeatedly uncontrolled BP than were other racial/ethnic groups and our findings also expand beyond documenting racial/ethnic disparities in aggressiveness of therapy by determining the roles racial/ethnic differences in clinic utilization among patients and racial/ethnic differences in the prevalence of diabetes play in mediating differences in providers' aggressiveness in treating hypertension. Our findings are consistent with several studies that have documented lower rates of BP control among diabetics,¹⁵⁻¹⁶ and others showing that providers often do not attain adequate BP control for patients, even after multiple opportunities to do so.^{2,17}

Our study has several limitations. We were unable to collect measures of patient adherence to prescribed therapy from the EMR. Providers may not want to intensify therapy at the same rate for patients they know are less compliant with therapy, although it is hard to identify these patients. We were also unable to determine English proficiency of each patient from the medical records. When a language barrier exists providers may be less likely to intensify therapy.

Patients we classified as "other" had a racial/ethnic classification of Asian/pacific islander, Native American, or "other" in our administrative data and were combined into one category for our analyses. Although we found that this group was less likely to have their therapy intensified, we had insufficient samples of each of these groups to determine which ones were least likely to have their therapy intensified. We examined patients who

received their care at primary care practices affiliated with a single large urban teaching hospital, and although there was substantial socioeconomic diversity in our sample our results may not be generalizable to smaller, rural, or non-teaching hospitals.

Conclusions

We found significant racial/ethnic differences in intensification of drug therapy, and that these differences were largely accounted for by differences in frequency of clinic visits and in the prevalence of diabetes. Future interventions should focus on increasing physician awareness of the need to intensify drug therapy more, and on encouraging providers to treat hypertension more intensively in diabetic patients.

Competing Interest: The authors declare that they have no competing interests.

Authors Contributions: LH conceived of the study, and participated in its design and coordination and helped to draft the manuscript. SS participated in the design of the study, performed the statistical analysis, and helped to draft the manuscript. DWB and JZA participated in the design of the study, and helped to draft the manuscript.

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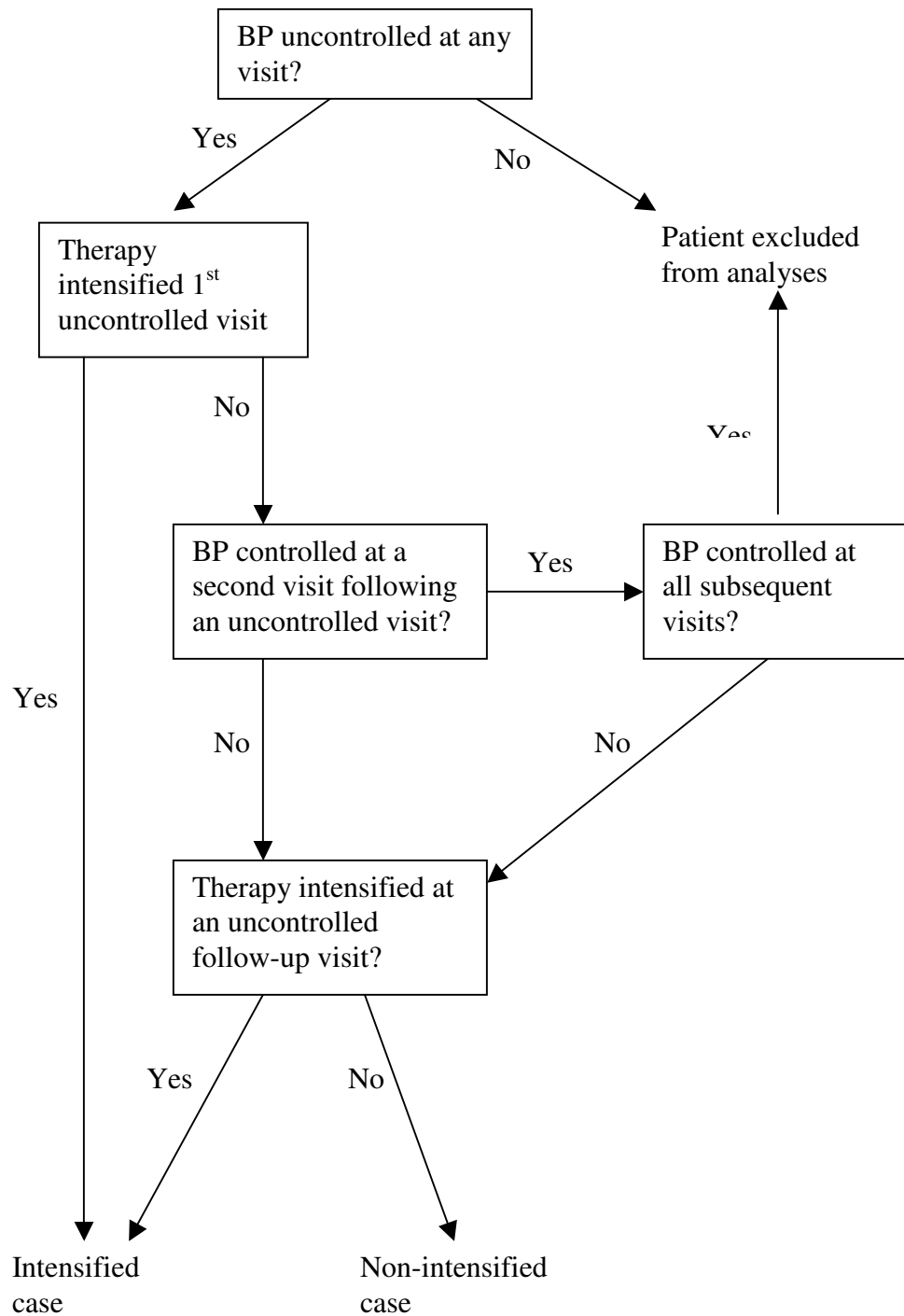
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Figure 1: Algorithm for determining intensified case



LEGEND FOR FIGURE

Figure 1:

Flow diagram of algorithm for determining an “intensified case.” Inter-rater reliability was high (kappa 0.90). We identified a total of 782 cases as either an “intensified case (N=617) or a “non-intensified case” (N=165).

Table 1: Demographic and Clinical Characteristics of Population by Race and Ethnicity

Variable	White (N=304)	Black (N=309)	Hispanic (N=144)	Other (N=25)	P value*
Men (%)	27.3	24.3	35.4	40.0	0.05
Age:					0.002
≤50 years	23.7	24.2	34.7	36.0	
50-60 years	23.7	29.8	21.5	28.0	
61-70 years	20.4	23.0	28.5	20.0	
> 70 years	32.2	23.0	15.3	16.0	
Annual household income [†] :					<0.001
≤ \$35,500	11.9	37.8	29.4	30.4	
\$35,501- \$43,140	11.9	40.8	21.0	21.7	
\$43,141- \$55,365	24.7	15.5	42.7	26.1	
> \$55,365	51.6	5.9	7.0	21.7	
Insurance:					<0.001
Private/ Medicare (%)	87.7	69.1	40.3	56.0	
Medicaid (%)	4.3	17.6	28.5	8.0	
Free care/ Self-pay (%)	8.0	13.4	31.3	36.0	
≤ 3 hypertension-related visits (%)	76.0	73.5	82.6	72.0	0.19
Diabetic (%)	14.5	27.5	27.8	12.0	<0.001

Coronary artery disease (%)	5.3	4.2	2.1	16.0	0.02
Provider experience (%) [‡] :					<0.001
Intern	2.1	9.3	10.1	4.0	
Resident	4.8	23.0	10.1	12.0	
Attending	93.2	67.8	79.8	84.0	

*Using chi-square tests for categorical variables.

[†]N=757 for those patients with zip code available.

[‡]N=716 for those patients with provider information available.

Table 2: Demographic and Clinical Characteristics of Population by Intensification of Therapy

Variable	Non-Intensified Case (N=165)	Intensified Case (N=617)	P value*
Patient race/ethnicity (%):			0.04
White	19.7	80.3	
Black	18.1	81.9	
Hispanic	28.5	71.5	
Other	32.0	68.0	
Men (%)	29.1	27.7	0.72
Age:			0.18
≤50 years	21.2	27.7	
50-60 years	27.3	25.5	
61-70 years	21.2	23.3	
> 70 years	30.3	23.5	
Annual household income [†] :			0.97
≤ \$35,500	27.0	25.9	
\$35,501- \$43,140	25.2	25.6	
\$43,141- \$55,365	25.2	24.3	
> \$55,365	22.6	24.3	

Insurance:			0.15
Private/ Medicare (%)	66.5	71.6	
Medicaid (%)	18.9	12.9	
Free care/ Self-pay (%)	14.6	15.5	
≤ 3 hypertension-related visits (%)	86.7	73.3	<0.001
Diabetic (%):			0.004
Yes	29.1	70.9	
No	18.9	81.2	
Coronary artery disease (%):			0.50
Yes	16.7	83.3	
No	21.3	78.7	
Provider training level (%) [‡] :			0.98
Intern	6.7	6.2	
Resident	12.7	12.9	
Attending	80.7	80.9	

*Using chi-square tests for categorical variables.

[†]N=757 for those patients with zip code available.

[‡]N=716 for those patients with provider information available.

Table 3: Adjusted odds ratios* [95% C.I.] of being an intensified case

Variable	Odds Ratios of being Intensified Case	95 % Confidence interval
Black [†]	1.13	[0.71 – 1.79]
Hispanic [†]	0.76	[0.44 – 1.31]
Other [†]	0.42	[0.18 – 0.99]
Age ≤ 50 years [‡]	2.40	[1.38 – 4.17]
Age 51- 60 years [‡]	1.46	[0.88 – 2.40]
Age 61- 70 years [‡]	1.79	[1.04 – 3.07]
Medicaid [§]	0.71	[0.40 – 1.26]
Free care or self pay [§]	1.15	[0.66 – 2.02]
> 3 hypertension-related visits	2.37	[1.42 – 3.97]
Diabetes ^{**}	0.56	[0.36 – 0.86]
Intern provider ^{††}	0.90	[0.43 – 1.88]
Resident provider ^{††}	1.03	[0.57 – 1.88]

* Adjusted for patient race/ethnicity, age, insurance status, number of hypertension-related visits, diabetes, and physician experience.

[†]Whites use as reference group

[‡]Aged >70 years used as reference group

[§]Privately insured or Medicare used as reference group

^{||}Three or fewer hypertension-related visits used as reference group

^{**}No diabetes used as reference group

^{††}Attending provider used as reference group