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## DOES THE USE OF HOME BLOOD PRESSURE MONITORING VARY BY RACE, EDUCATION, AND INCOME?

**Objective:** Home blood pressure (BP) monitors are commonly recommended for patients with hypertension, but little is known about their utilizations among different racial/ethnic groups. The objective of this study was to investigate if racial differences existed in the utilization of home BP monitoring devices.

**Design:** A voluntary and self-administered survey study.

**Setting:** Community pharmacies in the Greater Houston metropolitan areas, Texas, United States.

**Participants:** Subjects were recruited from community pharmacies if they were aged  $\geq 18$  years and received a prescription drug for hypertension.

**Interventions:** Each participant was given informed consent to complete a survey that consisted of questions about patient demographics and BP self-monitoring behavior.

**Main Outcome Measures:** The primary measures were the use of home BP monitors and the patient's knowledge of BP monitoring.

**Results:** A total of 987 pharmacy customers were approached, of whom 834 patients agreed to participate (34.3% African Americans, 33.3% Whites, and 28.9% Hispanics). We found no association between race and BP monitor utilization. Patients with less education and lower income were associated with lesser use of BP monitors ( $P=.04$  and  $P<.01$  respectively). Patients with higher education and higher incomes were more knowledgeable about how to monitor BP at home. ( $P<.01$ )

**Conclusion:** This study found that the utilization of BP monitors was not different among races. Patients with lower education level and less income were associated with less home BP monitor use. Further studies to investigate the adherence to home BP monitor use and intervention to overcome barriers to self-monitoring is needed. (*Ethn Dis.* 2010;20:2-6)

**Key Words:** Hypertension, Race, Education, Income, Monitor

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From Pharmacy Practice Department, College of Pharmacy and Health Sciences,

Ivy O. Poon, PharmD, BCPS; Nicole Etti, PharmD; Lincy S. Lal, PharmD, PhD

### INTRODUCTION

Hypertension is a common illness that affects approximately 1 billion individuals worldwide.<sup>1,2</sup> More than one-third of adults aged  $\geq 20$  years have hypertension in the United States.<sup>3</sup> Hypertension is a major health problem because it is a silent disease that causes serious complications such as stroke, myocardial infarction, heart failure, peripheral vascular disease, retinopathy, and nephropathy.<sup>4</sup> Despite increasing treatment options and awareness about hypertension, blood pressure (BP) control rates are still low across the world. The World Health Organization (WHO) suggested achieving 50% control rate by year 2010 in the Healthy People 2010 report.<sup>5</sup> The latest census of the US population showed that the control rate was 31% among all with hypertension and 53.1% among those who were being treated.<sup>6-8</sup>

Clinicians commonly recommend home BP monitors for patients with hypertension.<sup>9</sup> Home BP readings enable clinicians to include home BP into the decision process for dosage adjustments, and in some cases, to detect white coat hypertension.<sup>4</sup> Self BP monitoring is recommended in high blood pressure

treatment guidelines as a potentially useful tool in the management of hypertension.<sup>10</sup> Evidence has shown that an ambulatory BP reading was a stronger predictor for cardiovascular risk in older patients with isolated systolic hypertension, compared to a conventional BP reading at a physician's office.<sup>11</sup>

Studies have shown that African Americans have higher rates of hypertension, poorer blood pressure control, and were less likely to adhere to antihypertensive medications than Whites.<sup>12-15</sup> Compared to Whites, African Americans develop hypertension earlier in life, have a 1.3 times greater rate of nonfatal stroke, a 1.8 times greater rate of fatal stroke, a 1.5 times greater rate of heart disease death, and a 4.2 times greater rate of end-stage renal disease secondary to long term uncontrolled high blood pressure.<sup>16</sup> African Americans also have higher mortality rates from complications of hypertension as compared to Whites.<sup>17</sup> Recent data indicated that Hispanics had lower levels of hypertension awareness, treatment and control compared to Whites and African Americans.<sup>18</sup> Little is known about racial/ethnic differences in the utilization of home blood pressure

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Texas Southern University (IP, NE); Pharmacy Department, University of Texas M.D. Anderson Cancer Center (LL).

Address correspondence and reprint requests to Ivy Poon, PharmD, BCPS; Texas Southern University, College of Pharmacy and Health Sciences; 3100 Cleburne Street; Houston, TX 77004, USA; 713-313-4400; 713-313-7965 (fax); chui\_io@tsu.edu

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*Little is known about racial/ethnic differences in the utilization of home blood pressure monitoring devices.*

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monitoring devices. The purpose of this study was to investigate if the utilization and knowledge of BP monitors varied by different racial/ethnic groups.

## METHODS

### Study Population

The study was conducted in the Greater Houston metropolitan areas in the United States. Houston is the largest and fastest growing city in the State of Texas and the fourth largest city in population in the United States. In 2007, approximately 5.6 million individuals resided in the Greater Houston metropolitan area.<sup>19</sup> It is one of the most ethnically diverse cities in the United States, consisting of 55% Whites, 25% African American, and 20% individuals of other races or combination of two or more races. Of those, it is estimated that approximately 40% are of Latino or Hispanic origin.

Study participants were recruited from approximately 100 community pharmacies in the Greater Houston metropolitan areas. These pharmacies were branches of two major pharmaceutical services providers, Walgreens® pharmacy and CVS® pharmacy. The pharmacies are community pharmacies which sold prescription drugs, over-the-counter medications, personal hygiene products, beauty products, and food items. Study participants were recruited in the period from August through December of 2008. Inclusion criteria were men and women aged  $\geq 18$  years who received antihypertensive medication(s) from the pharmacies. Patients were excluded if they lived in a long-term care facility, hospital, hospice or assisted living facility.

### Data Collection

The study protocol was reviewed and approved by the Institutional Review Board at Texas Southern University prior to data collection. Patients who approached the pharmacy counter

to purchase antihypertensive medication(s) were requested by a surveyor to participate. The surveyor screened for participant's eligibility into the study based on inclusion and exclusion criteria. All surveyors were second-year pharmacy students and all received one hour of didactic lecture on how to conduct the survey. During the lecture, surveyors were educated about the survey tool, consent form, and surveying technique. Each student was encouraged to collect a maximum of 9 completed surveys, 3 from each of the three racial/ethnic groups (Whites, African Americans, or Hispanics). However, if it was impossible to identify participants of a specific race group at the pharmacy, the surveyor was allowed to recruit participants of other ethnic groups.

### Survey and Assessment Tool

The survey was self-administered by the participants and collected by the surveyor after completion. The survey was two pages in length and consisted of a total of 13 questions. It was divided into two sections: (1) demographics and BP monitor usage; and (2) BP monitoring knowledge assessment test, also known as Blood Pressure IQ Quiz. Prior to the beginning of the study, the survey was validated by two pharmacy faculty members, two health professionals, and ten patients to make certain the survey was easy to read and comprehend. The survey was available in English and Spanish. Data collected in the survey included patient demographics, education level, household income, and comorbidity diagnosis. In addition, blood pressure self-monitoring behavior data were collected including: years of hypertension diagnosis, use of home blood pressure monitor, type of blood pressure monitor used, frequency of checking blood pressure at home, education about blood pressure self-monitoring, frequency of blood pressure check at physician's office, and use of blood pressure log. If a

patient did not use a blood pressure monitoring device at home, the reason for not self-monitoring blood pressure was asked. The Blood Pressure IQ quiz was created to assess BP monitoring knowledge and was based on national guidelines and pharmacy tertiary references.<sup>10,20</sup> Each survey participant was given a copy of the assessment questions with his/her score and the answers at the end of the participation.

### Statistical Analysis

A sample size of 800 was required to detect a 10% difference in BP monitor usage with a power of 80% and an alpha error of .05. Data were input into an excel file then exported into STATA SE version 9.0 software for analysis. The number of participants by race, sex, annual income, education, and comorbidities were tabulated and reported in percentages. Univariate logistic regression analysis was utilized to determine if age, sex, race, education, income, and comorbidities influenced the use of a monitor. Univariate linear regression analysis was utilized to ascertain if patients' age, race, education, income and comorbidities resulted in a higher score on the hypertension knowledge quiz. A *P*-value of  $< .05$  was considered statistically significant and all tests were two-tailed.

## RESULTS

A total of 987 individuals were approached to participate in the survey. Of those, 834 individuals agreed to participate. Four surveys were non-usable because of incomplete information and therefore the final study population consisted of 830 participants. Demographics of study participants ( $n=830$ ) are reported in Table 1. The mean age of study participants was 46.1 years, range 18–90. The average years of hypertension diagnosis was 5 years. Among all participants, they had their BP checked by their healthcare providers, on average, every 145 days.

**Table 1. Demographics of survey respondents (N=830)**

	n	%
<b>Sex</b>		
Female	448	56.6
Male	344	43.4
<b>Race</b>		
Black	279	34.3
Hispanic	235	28.9
White	271	33.3
Asian	21	2.6
Other	8	0.9
<b>Highest level of education</b>		
Grade 12/high school	222	27.3
Associate degree	118	14.5
Technical school	83	10.2
4-year college	227	28.0
Graduate	113	13.9
None of the above	49	6.1
<b>Annual income (in US dollars)</b>		
\$0–\$24,999	205	26.3
\$25,000–\$49,999	260	33.3
\$50,000–\$74,999	183	23.5
≥\$75,000	132	16.9
<b>Co-morbidities</b>		
Arthritis	130	15.8
Diabetes	166	20.2
Stroke	21	2.6
Alzheimer’s disease	5	0.6
Parkinson’s disease	6	0.7
None of the above	542	65.8

Forty-nine percent (n=408) of participants claimed that they used a BP monitor at home. Among those who used BP monitors at home, 88 (21.6%) used a manual monitor and 315 (77.2%) used an automated machine. For those who monitored BP at home, on average, BP was monitored every 33 days, ranging from once daily to once a year. One hundred and thirty participants (31.9%) said they were instructed on how to use a BP monitor by a doctor; 85 (20.8%) by a pharmacist; 55 (13.5%) by a nurse; and 129 (31.6%) said no one taught them how to use a monitor. Only 270 (37.2%) participants said they presented records of BP readings to their doctors within the past year. Reasons for not monitoring BP at home are summarized in Table 2.

We found no association between race and use of BP monitors (see

**Table 2. Reasons for not monitoring blood pressure at home**

Reason	n	%*
Not important	131	31.1
Financial	96	22.8
Lack of time	57	13.5
Not sure how to use the machine	48	11.4
Lack of help	20	4.8
Health related disability (eg arthritis, poor vision)	13	3.1

\* Out of those who do not monitor BP at home (n=421); more than one response was allowed.

Table 3). Age, education, and income were positively related to increased usage of BP monitors. Participants with diabetes and stroke were more likely to monitor their BP at home and the longer participants were diagnosed with hypertension, the more likely they were to monitor their BP at home (P<.001; 95% C.I. 1.08–1.14).

The results for the blood pressure monitoring quiz are listed in Table 4. Each question was worth one point with a maximum score of five points. A total of 824 participants completed the quiz and the average score was 3.91. Linear regression analysis showed that participants with high school as the highest education were associated with lower scores (P<.01), whereas participants with college and graduate school education were associated with higher scores (P<.01). Participants with lower income (≤\$24,999 annually) were associated with lower scores (P=.01), and participants with higher incomes (\$50,000–\$74,999 and ≥\$75,000 annually) were associated with higher scores (P<.01 and P=.045 respectively). Participants with blood pressure monitors at home achieved higher scores than those who did not (P<.01).

**DISCUSSION**

Previous studies found that racial disparities existed in the treatment of cancer surgical procedures,<sup>21,22</sup> cardiac revascularization,<sup>23,24</sup> and mental health

**Table 3. Correlations of variables with blood pressure monitoring at home**

Variable	Odds Ratio	95% CI	P
Female sex	1.06	0.83–1.36	.60
Age	1.03	1.02–1.04	<.01*
<b>Race</b>			
Black	1.29	0.96–1.71	.08
White	1.13	0.84–1.50	.41
Hispanic	0.80	0.58–1.07	.14
Asian	0.54	0.20–1.42	.21
<b>Highest level of education</b>			
Grade 12/high school	0.73	0.53–0.99	.04*
Associate degree	0.89	0.60–1.31	.57
Technical school	1.02	0.64–1.59	.94
4-year college	1.33	0.97–1.80	.07
Graduate	1.88	1.25–2.81	<.01*
None of the above education	0.44	0.23–0.81	<.01*
<b>Annual Income (in US dollars)</b>			
≤\$24,999	0.45	0.32–0.62	<.01*
\$25,000–\$49,999	0.97	0.72–1.29	.82
\$50,000–\$74,999	1.78	1.27–2.48	<.01*
≥\$75,000	1.35	0.92–1.95	.12
<b>Comorbidities</b>			
Arthritis	1.89	1.28–2.77	<.01*
Diabetes	2.36	1.65–3.37	<.01*
Stroke	3.44	1.24–9.48	.01*
Alzheimer’s disease	4.18	0.46–37.5	.20
Parkinson’s disease	1.04	0.20–5.17	.96
None of the above	0.43	0.31–0.57	<.01*

\* P<0.05 considered statistically significant.

therapy.<sup>25,26</sup> These were relatively expensive and specialized treatment options that may not be available to minority population with limited

*Our results showed that there was no significant difference in the utilization of blood pressure home monitoring among races.*

**Table 4. Testing your blood pressure IQ**

Question	Maximum Score	Correct Response n (%*)
1. Which of the following is the most desirable blood pressure reading? a. 160/95 b. 120/80 (correct answer) c. 130/90 d. 140/80	1	597 (72.5)
2. Many over-the-counter cough and cold medications can increase your blood pressure. a. True (correct answer) b. False	1	637 (77.3)
3. When measuring your blood pressure you should first? a. Rest for 3 to 5 minutes then check your blood pressure (correct answer) b. Go take a jog then check your blood pressure c. Drink a cup of coffee then check your blood pressure d. Go smoke a cigarette and then check your blood pressure	1	751 (91.1)
4. Using a cuff that is too small for your arm can overestimate your blood pressure and one that is too big can underestimate your blood pressure. a. True (correct answer) b. False	1	669 (81.2)
5. Blood pressure monitors that measure your blood pressure in your finger or your wrist are not usually accurate and are not recommended. a. True (correct answer) b. False	1	553 (67.1)

\* Out of 824 participants who completed the blood pressure IQ assessment.

healthcare access. Our study investigated the utilization of easily available blood pressure monitoring devices ranging in price from US\$20 to US\$150.<sup>27</sup> Our results showed that there was no significant difference in the utilization of blood pressure home monitoring among races. This could be in agreement with previous studies that found racial disparities focus on more expensive and specialized procedures (ie surgical resection, revascularization, behavioral therapy), compared to a BP monitoring device that is easily available to the public. Studies have also shown that health belief model also affects health services utilization; if an individual believes that a BP monitor will help with controlling high blood pressure, he or she is more likely to use one. This study indicated that the utilization of a

BP monitor was similar among Whites, African Americans, and Hispanics, which implied that their belief models regarding a BP monitor were similar.

Our study showed that higher education levels were associated with an increased rate of BP monitor use. This finding is consistent with previous studies on health service utilization.<sup>28-30</sup> Our study also found that patients with lower income were less likely to monitor their blood pressure at home. Among participants who earned less than \$25,000 a year, only 38.7% used a blood pressure monitor. The cost of BP monitors is not reimbursed by insurance companies; most patients paid for their BP monitor. For those who were financially stressed, the cost of purchase may have been a barrier. Participants with a history of stroke and diabetes

were more likely to monitor their blood pressure at home compared to participants without comorbidities.

There are limitations to our study. First, the utilization of BP monitor was self-reported by participants. A home visit to collect BP monitor utilization data to actually see the participants monitoring their blood pressures would have been more accurate. However, due to the large sample size and extensive labor cost in performing home visits, it was not feasible. Second, the survey did not capture blood pressure monitoring at the pharmacies. Most pharmacies in the United States have free blood pressure monitoring services. It was possible that the participants did not monitor blood pressure at home, but at the pharmacy instead. Third, the study did not capture those who did not come to the pharmacy and sent someone else to pick up their medications.

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### AUTHOR CONTRIBUTIONS

*Design concept of study:* Poon, Etti, Lal

*Acquisition of data:* Poon

*Data analysis and interpretation:* Poon, Lal

*Manuscript draft:* Poon, Etti, Lal

*Statistical expertise:* Poon, Lal

*Administrative, technical, or material assistance:* Poon, Etti

*Supervision:* Poon