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DISPARITIES IN ANTIHYPERTENSIVE MEDICATION ADHERENCE IN ADOLESCENTS

Michelle N. Eakin¹, Tammy Brady², Veni Kandasamy¹, Barbara Fivush², and Kristin A. Riekert¹

¹Johns Hopkins Adherence Research Center, Department of Medicine Johns Hopkins School of Medicine

²Division of Nephrology, Department of Pediatrics, Johns Hopkins School of Medicine

Abstract

Background—Hypertension affects up to 5% of all children but little is known about the role of medication adherence on blood pressure (BP) control. This study examined the association between adolescents' antihypertensive medication adherence and BP control, investigating for racial disparities.

Methods—21 adolescents with essential hypertension (mean age=14.7 ±2.0 years, 57% male, 52% African American; AA) were recruited from a pediatric nephrology clinic. Objective medication adherence measures were obtained with Medication Event Monitoring System (MEMS) caps and pharmacy refill records to determine Medication Possession Ratios (MPRs).

Results—AAs had lower medication adherence measured by MPR over the past 12 months (Mean = 0.54±0.21 vs. 0.85±0.16 for AA and non-AA; $p < 0.001$) and a trend for less adherence measured by MEMS caps over the last 28 days (Mean = 0.75 ±0.26 vs. 0.91±0.04; $p < 0.07$). Seven out of eight participants with low adherence (MPR<0.65) had uncontrolled BP (systolic and/or diastolic BPs ≥95th percentile) and no participants with high adherence by MPR had uncontrolled BP ($p < 0.001$). There was no difference in BP control by race.

Conclusions—Antihypertensive medication adherence measured by pharmacy refills was associated with BP control. AAs were more likely to have lower medication adherence. Targeting medication adherence through the use of electronic medical records may be a potential mechanism to reduce health disparities.

Keywords

Medication; Adherence; Disparities; Hypertension; Adolescents

Introduction

The prevalence of hypertension in children and adolescents is increasing (1;2). Recent estimates state that hypertension affects approximately 3.2–4.5% of all children (3;4). Hypertension in children and adolescents is linked to target-organ damage, including left ventricular hypertrophy, microalbuminuria, increased carotid intima-media thickness,(5) and renal disease progression.(6) Longitudinal studies show that high blood pressure (BP) in children and adolescents confers a higher risk of hypertension as an adult (7).

Address Correspondence to: Michelle N. Eakin, Ph.D., Johns Hopkins University, Division of Pulmonary and Critical Care Medicine, 5501 Hopkins Bayview Circle, 4B.74, Baltimore, MD 21224, meakin1@jhmi.edu.

Antihypertensive medications have been shown to not only reduce blood pressure, but also to reduce/regress target organ damage (8). Despite these health benefits, non-adherence to anti-hypertensive medications is common among adults with hypertension. A recent review of chronic medication adherence among 706,032 adults found that 28% of patients on antihypertensive medications were less than 80% adherent (9). Non-adherence is also reported among adolescents: a single-center cohort of adolescent patients with primary hypertension found that at least half of the treated patients who had poor BP control did so because of self-reported non-adherence to medication (10).

Ethnic minority populations have disproportionately high rates of poor BP control. Among adult populations, African Americans have earlier onset of hypertension, higher prevalence, and worse control and are more likely to experience end-organ damage compared to white adults (11–14). In a study of cardiovascular functioning of racially and socioeconomically diverse healthy adolescents, it was found that an individual's race predicted elevated blood pressure measurements as well as greater blood pressure (BP) reactivity to stressors (14). Factors that have been shown to contribute to this disparity among adults include reporting antihypertensive medication non-adherence, and an increased number of medication side effects (15). However, little information is known about the racial disparities in blood pressure control or medication adherence among adolescents with hypertension.

The aims of this pilot study were to obtain preliminary estimates of adolescents' objectively measured adherence, as well as parent- and self-reported adherence, to antihypertensive medications and examine its associations with blood pressure control and race. We hypothesized that medication adherence would be associated with blood pressure control such that adolescents with high adherence would be more likely to have their blood pressure well-controlled. Furthermore, we hypothesized that African American adolescents would be more likely to have lower medication adherence and worse blood pressure control than non-African American adolescents.

Methods

Study Design

This was an observational study of children recruited from the Johns Hopkins University Harriet Lane Kidney Center, which is a general pediatric nephrology clinic that serves children from birth through age 22 years. The Johns Hopkins Medical Institutions Institutional Review Board reviewed and approved this study. Written informed consent was obtained from the adolescent's primary caregiver and written assent was obtained by the adolescent prior to baseline assessment. Trained research assistants conducted all assessment visits with participants either at the clinic or the participant's home. Families who agreed to participate underwent three study visits either at their home or at their scheduled nephrology clinic visit.

At the first visit, a research assistant placed one of the participant's antihypertensive medications in a bottle that was fitted with a Medication Event Monitoring System (MEMS) cap. Due to cost only one of the patient's prescribed antihypertensive medications was monitored with a MEMS cap. The family was instructed in the proper use of the MEMS cap and informed that the cap recorded the time and date when the bottle was opened to indicate that the medication was taken. Two subsequent visits were completed approximately two weeks apart in order to retrieve the MEMS cap data and complete a debriefing interview about the family's experience with the MEMS cap. The goal was to collect at least 28 days of data. Caregivers provided the name and contact information for all pharmacies they used to obtain antihypertensive medications in the previous 12 months. Each pharmacy was faxed

an introductory letter requesting refill records along with a copy of the patient's signed consent form. Pharmacies were pursued until records were received.

Participants

Eligibility criteria were as follows: adolescents aged 11–17 years who had a diagnosis of essential hypertension, were currently prescribed antihypertensive medication and received care at the Johns Hopkins Harriet Lane Kidney Center. Eighty five adolescents were identified and were sent a letter from the clinic director with information about the study. Patients were informed that if they were not interested in the study they could call the study coordinator and opt out. No patient used this option. Fifty nine families were contacted by phone due to geographical proximity. Fifty one families were screened to confirm eligibility (4 families refused and 4 had wrong numbers), had the study described in more detail to the parent and adolescent and, if interested, a first visit was scheduled. Among screened participants, 32 were eligible (reasons for ineligibility: 8 were not prescribed antihypertensive medication, 2 did not live in state, 2 did not speak English, 2 had developmental delay, 4 were not interested, and 1 child was too old) and visits were completed with 22 participants (reasons for non-completion: 1 no longer prescribed medication, 8 unable to contact, 1 not interested). Two of the 22 families contacted the office interested in participation: their adherence was not different than other recruited participants. Participants were not different than non-participants by age, gender, BP percentile and race.

Measures

MEMS Ratio—The MEMS cap is an electronic monitor that records the date and time of pill bottle opening. A mean MEMS ratio was calculated by using the number of events the cap was opened during the 28-day monitoring period as the numerator and the number of doses prescribed for the same period as the denominator. Due to cost limitation, only one antihypertensive medication was monitored.

Medication Possession Ratio—Pharmacy refill records were used to calculate a medication possession ratio (MPR), defined as the sum of all days of medication supply received divided by the number of days the medication was prescribed during the study period.(16) MPRs were calculated for each of the targeted medications individually with values truncated to 100%. The MPRs of each medication for the past 12 months were averaged across all hypertension medications to obtain the composite MPR. If an individual was prescribed only one drug, then the composite MPR is equal to his or her MPR for that individual drug.

Medication Adherence Measure—Parents and teens both completed the 8- item Medication Adherence Measure developed by Morisky et al. (17) at the end of MEMS monitoring during visit 3. This measure asks patients about specific behaviors that may interfere with their ability to regularly take medication such as “do you sometimes have problems remembering to take your medication?” The self-report version was modified for the parents so that parents reported on their teen's adherence. Response categories are scored yes/no for the first seven items and a 5-point Likert response for the last item. In order to account for missing data a ratio of the sum of responses divided by total items answered was created such that higher scores indicated more no-nadherent behavior.

Health Outcome Information—Health outcome information, including blood pressure measurements, comorbidities, height, weight and prescribed treatment regimen information were abstracted from the participant's medical record from their last clinic visit. All blood pressures were measured by manual auscultation according to published guidelines.(18) Patients were considered to have their BP under control if their systolic and diastolic BP was

below their age-, sex- and height-specific 95th percentile BP. Children with either their systolic or diastolic BP at or above their 95th percentile BP at the most recent clinic visit were considered to have poor BP control (18).

Statistical Analyses

Descriptive frequencies of sociodemographic characteristics were generated using means and proportions as appropriate. To determine how well the different measures of adherence correlated with each other, a correlation matrix was constructed with values closer to either -1 or +1 indicating good agreement and 0 indicating poor agreement. Statistical comparisons between groups were made using Fisher's exact tests for categorical data. Because there is no standard definition of adherence based across all measures, we used each measure's median to divide participants into two groups: low and high adherence. A median split was conducted at the following cutpoints for each measure: MPR = 0.65, MEMs ratio = 0.89, and parent/teen report = 0.5 to examine differences in blood pressure control by adherence. SAS 9.2 (SAS System, Cary, NC) was used for all statistical analyses. P-values <0.05 were considered statistically significant.

Results

Sample Characteristics

A total of 22 adolescents and their parents consented to join the study. One participant did not complete any follow-up visits, resulting in a final sample of 21 participants. A total of ten (48%) were African American (AA), while eleven (52%) were non-AA. Included in the non-AA group were children who reported their race as white or Asian. Table 1 presents the baseline demographic characteristics. African Americans had lower parental education and household income than non-African American children ($p < 0.05$ for both variables). Overall, 10 (48%) adolescents had systolic and/or diastolic blood pressure readings at or above the 95th percentile for their age, sex and height, the majority of whom were AA (70% vs. 30% non-AA) (Table 2). There was a range of medication regimens with the most frequent regimen being a single prescription for amlodipine (7 adolescents; 33%) followed by a single prescription for lisinopril (6 adolescents; 29%). Eight adolescents (38%) were treated with more than one antihypertensive medication. Average length of MEMs cap monitoring was 30.5 ± 6.82 days with no differences by race.

Measures of Medication Adherence

The MEMS ratio for the past 28 days (mean = 0.82 ± 0.22) was significantly higher than MPR for the past 12 months (mean = 0.66 ± 0.25 ; $p < 0.04$). Although parent and teen reports of adherence were significantly correlated with each other (spearman's rho = 0.71, $p < 0.003$) only parent reported adherence correlated with MEMS ratio (spearman's rho = -0.49, $p < 0.02$). Furthermore, MPR did not correlate with the MEMs ratio (spearman's rho = 0.25, $p = 0.35$). See Table 3 for a complete correlation matrix.

Association between Medication Adherence and Blood Pressure Control

Participants were divided into adherence groups using a median split for all measures of adherence. Individuals above the median on MPR had a higher prevalence of BP control than those individuals who were below the median MPR (100% vs 36% with good BP control, $p < 0.001$). (Figure 1a; systolic: $p < 0.01$; diastolic: $p < 0.48$). In fact, seven of the eight participants with low adherence by MPR had poorly controlled blood pressure whereas none of the eight participants with high adherence by MPR had poorly controlled blood pressure (Figure 2). However, there were no significant differences in blood pressure percentiles or number of participants with controlled blood pressures between patients in the low vs. high

adherence groups as assessed by MEMS caps or parent and teen self-report measure (Figure 1b–c).

Race Comparisons

Differences in adherence and blood pressure control were examined between African American and non-African American participants (Table 2). There was a significant difference in adherence measured by MPR with AAs more likely to have lower medication adherence than non-AAs (Mean MPR = 0.54 ± 0.21 vs. 0.85 ± 0.16 for AA and non-AA; $p < 0.001$). Adherence measured by MEMS ratio also revealed AA adolescents to have lower adherence than non-AA adolescents, however this difference did not reach statistical significance (Mean MEMS ratio = 0.75 ± 0.26 vs. 0.91 ± 0.04 for AA and non-AAs; $p = 0.07$). However, both AA adolescents and parents were more likely to report higher adherence on the self-report scale ($p < 0.02$ and $p < 0.04$ respectively). Seven out of eleven (64%) AA compared to three out of 10 (30%) non-AA had poor BP control ($p = 0.18$).

Discussion

This study is one of the first to examine adherence to antihypertensive medications among adolescents with hypertension. The results show that adherence to medication as measured by one year of pharmacy refill records correlates with blood pressure control, but adherence measured by 30 days of MEMS caps and by parental/teen self-report was not significantly associated with BP control. Interestingly, African American adolescents were more likely to have lower medication adherence; but there were no racial differences in blood pressure control.

Disparities in prevalence of hypertension between African American and non-African Americans have been previously reported in adults (11;12). African Americans are more likely to have a diagnosis of hypertension and to have worse morbidity and mortality due to poorly controlled hypertension (19). As in our study, antihypertensive medication pharmacy refills rates have been shown to be lower for African American adults compared to White adults. Furthermore, self-reported adherence has been associated with poorer blood pressure control (11). Our study is one of the first to demonstrate that racial disparities in medication adherence may start as early as adolescence.

Previous research among adults with hypertension has identified a number of possible explanations for lower adherence. One of the most salient factors is medication health beliefs. Patients who perceive medications to be harmful and non-effective are more likely to be non-adherent to their prescribed medications (20). In a large study of 806 adults seen in an urban care center for hypertension, African American adults were more likely to report non-adherence, more concerns about the medications and lower endorsement that medications are needed to manage their hypertension (15). Other sociodemographic factors associated with medication adherence as well as blood pressure control include income level, educational attainment, health literacy as well as patient-physician communication (21). Given that most of the identified factors associated with these racial disparities are potentially modifiable, they are likely targets for interventions to improve medication adherence and health outcomes among African Americans.

Culturally sensitive interventions are needed to improve medication adherence among African American adolescents. Adolescence is a critical window for adherence since previous research across illnesses has demonstrated that adherence declines during this age (22). As such, earlier intervention is essential to prevent non-adherence; once this behavior is learned, it is more difficult to change. Previous research in other chronic illnesses has demonstrated that interventions need to be multilevel in order to affect the wide array of

barriers to medication adherence (23). Furthermore, clinicians need to routinely assess and discuss adherence with their patients in order to prevent worse health outcomes.

Our results did identify differences in adherence measurement according to method. Adherence assessed by the MPR was much lower than when assessed via the MEMS ratio. There are several possible explanations for this. The electronic monitoring period with the MEMS cap was for a limited time period of approximately 28 days. Previous research has shown that monitoring can lead to patient reactivity and increase adherence behavior. (24) Furthermore, medication adherence over time involves a complex set of behaviors. It includes coordinating refills with the provider, obtaining the medication from the pharmacy, as well as taking the medication as prescribed. The MEMS cap only assesses the last step of adherence whereas pharmacy refills may reflect all three steps. In our study, participants had to have medications in the home to participate. Therefore, one hypothesis for the seemingly contradictory results may be that many teens remember to take their medication when it is available and they know they are being observed but have difficulty coordinating refills with their parents, since they are dependent on them to obtain the medication from the pharmacy.

This study has several limitations that affect its generalizability. This was a pilot study examining antihypertensive medication adherence among adolescents so the results are based on a small sample size and may not represent the general population of adolescents with hypertension. Because of the small sample size, we were not able to control for other sociodemographic factors that may be associated with blood pressure control such as age, gender, income, and education level. We were also not able to conduct multivariable models to control for race when looking at the association between adherence and BP control. There is no established cut point for adherence among adolescents, therefore, we utilized median splits based on this sample for each measure, which we acknowledge limits generalizability. Additionally, we relied on a single manual BP measurement obtained at a clinic visit. This does not take into account the variability of BP measurement. Future research should use 24 hour ambulatory blood pressure measurement as this provides a more efficient and precise assessment of BP than one set of daily CBP measurements (25;26). Finally, the participants included in this study were recruited from a tertiary care center and have a number of other health comorbidities, which may affect overall treatment regimens and self-management skills.

Future studies with larger samples are needed to confirm and further examine this possible link between medication non-adherence and blood pressure control among adolescents. Identifying the role modifiable factors such as adherence play on blood pressure control is important in order to develop targeted clinical and behavioral interventions to improve blood pressure control and reduce health disparities. Previous research among adults has identified a number of other sociodemographic variables (e.g. education level, SES status, other ethnic groups) that are also associated with hypertensive adherence and BP control. It is important that larger studies evaluate the impact of these factors on adherence and BP control in pediatric population.

Furthermore, longitudinal studies are needed to determine the impact of non-adherence on health outcomes and the potential mediating role of non-adherence to known health disparities between African American and whites. Given the advent of e-prescribing and the use of electronic medical records, pharmacy records to calculate MPRs may be more easily available. Research is needed to validate the results of this study and to understand how we can best incorporate this information into clinical care. A recent study found that when clinicians used patient pharmacy adherence data during an asthma clinical encounter and addressed non-adherence with their patients, patient adherence significantly increased; however, only a minority of clinicians used this data (27). Therefore, more research and

clinician engagement will be needed on how to use these administrative data effectively to improve patient adherence and overall health.

Reference List

1. Sorof JM, Lai D, Turner J, Poffenbarger T, Portman RJ. Overweight, ethnicity, and the prevalence of hypertension in school-aged children. *Pediatrics*. 2004; 113:475–482. [PubMed: 14993537]
2. Flynn J, Falkner B. Children and adolescents with obesity-associated high blood pressure. *Journal of the American Society of Hypertension*. 2008;267–274. [PubMed: 20409907]
3. May AL, Kuklina EV, Yoon PW. Prevalence of cardiovascular disease risk factors among US adolescents, 1999–2008. *Pediatrics*. 2012; 129:1035–1041. [PubMed: 22614778]
4. Brady TM, Solomon BS, Neu AM, Siberry GK, Parekh RS. Patient-, provider-, and clinic-level predictors of unrecognized elevated blood pressure in children. *Pediatrics*. 2010; 125:e1286–e1293. [PubMed: 20439598]
5. Karpettas N, Kollias A, Vazeou A, Stergiou GS. Office, ambulatory and home blood pressure measurement in children and adolescents. *Expert Rev Cardiovasc Ther*. 2010; 8:1567–1578. [PubMed: 21090932]
6. Hadtstein C, Schaefer F. Hypertension in children with chronic kidney disease: pathophysiology and management. *Pediatr Nephrol*. 2008; 23:363–371. [PubMed: 17990006]
7. Flynn JT. Pediatric hypertension: recent trends and accomplishments, future challenges. *Am J Hypertens*. 2008; 21:605–612. [PubMed: 18437129]
8. Litwin M, Niemirska A, Sladowska-Kozłowska J, Wierzbicka A, Janas R, Wawer ZT, Wisniewski A, Feber J. Regression of target organ damage in children and adolescents with primary hypertension. *Pediatr Nephrol*. 2010; 25:2489–2499. [PubMed: 20730452]
9. Briesacher BA, Andrade SE, Fouayzi H, Chan KA. Comparison of drug adherence rates among patients with seven different medical conditions. *Pharmacotherapy*. 2008; 28:437–43. [PubMed: 18363527]
10. DiPietro A, Kees-Folts D, DesHarnais S, Camacho F, Wassner SJ. Primary hypertension at a single center: treatment, time to control, and extended follow-up. *Pediatr Nephrol*. 2009; 24:2421–2428. [PubMed: 19714367]
11. Bosworth HB, Powers B, Grubber JM, Thorpe CT, Olsen MK, Orr M, Oddone EZ. Racial differences in blood pressure control: potential explanatory factors. *J Gen Intern Med*. 2008; 23:692–698. [PubMed: 18288540]
12. Gadegbeku CA, Lea JP, Jamerson KA. Update on disparities in the pathophysiology and management of hypertension: focus on African Americans. *Med Clin North Am*. 2005; 89:921–33. 930. [PubMed: 16129104]
13. Kurian AK, Cardarelli KM. Racial and ethnic differences in cardiovascular disease risk factors: a systematic review. *Ethn Dis*. 2007; 17:143–152. [PubMed: 17274224]
14. Murphy JK, Stoney CM, Alpert BS, Walker SS. Gender and ethnicity in children's cardiovascular reactivity: 7 years of study. *Health Psychol*. 1995; 14:48–55. [PubMed: 7737073]
15. Kressin NR, Orner MB, Manze M, Glickman ME, Berlowitz D. Understanding contributors to racial disparities in blood pressure control. *Circ Cardiovasc Qual Outcomes*. 2010; 3:173–180. [PubMed: 20233981]
16. Steiner JF, Prochazka AV. The assessment of refill compliance using pharmacy records: methods, validity, and applications. *J Clin Epidemiol*. 1997; 50:105–116. [PubMed: 9048695]
17. Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. *J Clin Hypertens (Greenwich)*. 2008; 10:348–354. [PubMed: 18453793]
18. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. *Pediatrics*. 2004; 114:555–576. [PubMed: 15286277]
19. Davis AM, Vinci LM, Okwuosa TM, Chase AR, Huang ES. Cardiovascular health disparities: a systematic review of health care interventions. *Med Care Res Rev*. 2007; 64:29S–100S. [PubMed: 17881625]

20. Lukoschek P. African Americans' beliefs and attitudes regarding hypertension and its treatment: a qualitative study. *J Health Care Poor Underserved*. 2003; 14:566–587. [PubMed: 14619556]
21. Hertz RP, Unger AN, Cornell JA, Saunders E. Racial disparities in hypertension prevalence, awareness, and management. *Arch Intern Med*. 2005; 165:2098–2104. [PubMed: 16216999]
22. Dean AJ, Walters J, Hall A. A systematic review of interventions to enhance medication adherence in children and adolescents with chronic illness. *Arch Dis Child*. 2010; 95:717–723. [PubMed: 20522463]
23. Canino G, McQuaid EL, Rand CS. Addressing asthma health disparities: a multilevel challenge. *J Allergy Clin Immunol*. 2009; 123:1209–1217. [PubMed: 19447484]
24. Schoenthaler A, Ogedegbe G. Patients' perceptions of electronic monitoring devices affect medication adherence in hypertensive African Americans. *Ann Pharmacother*. 2008; 42:647–652. [PubMed: 18397971]
25. Gimpel C, Wuhl E, Arbeiter K, Drozd D, Trivelli A, Charbit M, Gellermann J, Dusek J, Jankauskiene A, Emre S, Schaefer F. Superior consistency of ambulatory blood pressure monitoring in children: implications for clinical trials. *J Hypertens*. 2009; 27:1568–1574. [PubMed: 19550356]
26. Vollmer WM, Appel LJ, Svetkey LP, Moore TJ, Vogt TM, Conlin PR, Proschan M, Harsha D. Comparing office-based and ambulatory blood pressure monitoring in clinical trials. *J Hum Hypertens*. 2005; 19:77–82. [PubMed: 15361888]
27. Williams LK, Peterson EL, Wells K, Campbell J, Wang M, Chowdhry VK, Walsh M, Enberg R, Lanfear DE, Pladevall M. A cluster-randomized trial to provide clinicians inhaled corticosteroid adherence information for their patients with asthma. *J Allergy Clin Immunol*. 2010; 126:225–31. 231. [PubMed: 20569973]

A. Medication Possession Ratio by median split (MPR)

B. Medication Event Monitoring System (MEMS) Ratio

C. Parent and Teen Reported Adherence†

† Higher scores indicate lower adherence

BP – blood pressure

Figure 1a–c.
Blood Pressure Control for High and Low Adherence Groups

Figure 2.
MPR (Medication Possession Ratio) by BP (blood pressure) percentile

Table 1

Baseline Demographic Characteristics

Characteristics	Overall (N=21) N (%)	African American (N= 11) N (%)	Non- African American (N=10)** N (%)	p- value
CHILD CHARACTERISTICS				
Age, mean (SD)	14.7±2.0	14.7±1.9	14.8±2.3	0.39
Female	9 (43)	6 (54)	3 (30)	0.25
FAMILY CHARACTERISTICS				
Health Insurance Status				0.03
Medical assistance	4 (19)	4 (36)	0(0)	
Private insurance/HMO	17(81)	7 (64)	10 (100)	
Caregiver Education				0.04
Less than High School	2 (9)	2 (18)	0 (0)	
H.S. degree or some college	10 (24)	7 (36)	3(10)	
College or Advanced Degree	9 (24)	2 (9)	7 (40)	
Household income				0.01
Less than \$50,000/yr	7 (33)	6 (55)	1 (10)	
\$50–100k	4(19)	2 (18)	2 (20)	
>\$100K	7 (33)	1(9)	6 (60)	
Missing	3 (15)	2 (18)	1 (10)	

Includes Caucasian (8), Asian (1), Hispanic (1)

Table 2

Means (SDs) and N (%) of Antihypertensive Medication Adherence by Race

Race	Overall		African American		Non-African American		P value
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	
Parent reported adherence [†]	21	0.49 (0.35)	11	0.66 (0.37)	10	0.31 (0.23)	0.02
Teen reported adherence [†]	21	0.51 (0.26)	11	0.63 (0.23)	10	0.39 (0.25)	0.04
MPR [*] ratio	16	0.65 (0.2)	10	0.54 (0.2)	6	0.85 (0.2)	0.009
MEMS ^{**} ratio	21	0.83 (0.2)	11	0.75 (0.3)	10	0.91 (0.05)	0.07

[†] Higher scores on parent and teen reported adherence indicate lower adherence

^{*} MPR=Medication Possession Ratio

^{**} MEMS ratio = Medication Event Monitoring System Ratio

Table 3

Correlation matrix between adherence measures and blood pressure percentiles.

	Parent reported adherence [†]	Teen reported adherence	MPR ratio
Teen reported adherence [†]	0.71 *		
MPR ratio	-0.32	0.01	
MEMS ratio	-0.49 *	-0.36	0.25

MPR ratio=Medication Possession Ratio, MEMS ratio = Medication Event Monitoring System Ratio

[†] Higher scores indicate lower adherence*
p<0.05