Provider Adherence to National Guidelines for Managing Hypertension in African Americans

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Abstract

Purpose. The purpose of this retrospective chart review is to evaluate health care provider adherence to national guidelines for the treatment of hypertension in African Americans. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) guidelines were used as the basis for comparison to documented care.

Design. This pilot exploratory study used a descriptive, pre-experimental, quantitative method to conduct a retrospective chart review for African American patients aged 20 to 80 years old who had been diagnosed with hypertension to examine the degree of provider adherence to national hypertension management guidelines.

Methods. The electronic medical records (EMR) in a rural clinic were reviewed from July 1, 2014 through August 31, 2014 to identify patients who were African Americans aged 20 to 80 years diagnosed with hypertension and were taking antihypertensive medications. Demographic data collected included age, gender, marital status and health insurance. Clinical data collected included blood pressure, medications prescribed, laboratory studies including urine microalbumin levels (if diabetic), lifestyle modification recommendations, referral to specialized professionals and frequency of follow-up. Clinical data were compared to the JNC recommendations.

Findings. Overall provider adherence averaged 75%. Provider adherence was present on 87% of participants on combination therapy and 0% in patients on monotherapy. Weight loss, sodium restriction and physical activity recommendations were documented on 82.3% of patients. DASH diet and alcohol consumption was only documented in 6.5% of the participants. Provider follow-up was documented in 96.6% of the patients with controlled blood pressure and 9.1% in

patients with uncontrolled blood pressure. Adherence in prescribing ACEIs in patients with a comorbidity of DM was documented in 70% of the patients. Only 15.2% of diabetics were ordered micro albumin levels. Laboratory adherence prior to beginning pharmacologic regimens was documented in 0% of the patients and biannual routine labs were documented prior to beginning treatment 65% of the time.

Conclusion. Provider adherence is moderately high in prescribing TDs or CCBs as combination therapy. Provider adherence is poor in prescribing TDs or CCBs in monotherapy. However, there appears to be no relationship to provider adherence and blood pressure outcomes. These findings may be due to the short time period of the study and documentation being available in the EMR for only the last five years. These findings warrant further research.

Key words: provider adherence, antihypertensive therapy, African Americans.

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Appendices

Provider Adherence to National Guidelines for Managing Hypertension in African Americans

Hypertension (HTN) is a medical condition that is characterized by high or uncontrolled blood pressure. Inadequate control of HTN can lead to more serious vascular conditions affecting the major blood vessels in the heart, brain and body. Additionally, HTN and diabetes mellitus (DM) frequently coexist, which further increases the risk of developing vascular complications. Vascular complications are a group of disorders that affects the heart and blood vessels. Hypertension is a major risk factor for vascular disease including heart attacks and strokes (Bosworth et al., 2006). In 2008, an estimated 17.3 million people died from vascular complications. Of those 17.3 million vascular-associated deaths, 6.2 million were due to strokes (World Health Organization, 2013). It is predicted that by the year 2030, an estimated 23.3 million will die from stroke and heart disease (WHO, 2013). Addressing risk factors that contribute to HTN may help prevent vascular complications. According to the World Health Organization (WHO) (2013), complications of HTN such as strokes account for 9.4 million of the astounding 17 million vascular-associated deaths. Another consideration is the financial burden of HTN; according to the Centers for Disease Control and Prevention (CDC) (2012), the annual cost of HTN treatment was 131 billion dollars.

The physical and financial burdens of HTN are not unique to any one group of individuals. However, it has been well documented that African Americans (AAs) have a disproportionate burden of morbidity and mortality compared to Caucasians (Bosworth et al., 2006). Data collected from 2008 suggest that non-Hispanic blacks accounted for 31.7 % of the 59.4 million people with HTN, whereas non-Hispanic whites accounted for only 26.8 % (Carroll, 2011). Not only do AAs have an increased prevalence of HTN compared to whites, but they also develop it at earlier ages (Center for Disease Control and Prevention, 2015). Despite research

and interventions to decrease both the physical and financial burdens of uncontrolled HTN, specifically in the AA population, HTN remains a national problem.

Numerous interventions have been documented to improve control of HTN in AAs. The aims of such interventions have been to reduce the barriers to better control. There are three categories of barriers to addressing the burden of uncontrolled HTN: 1) patient-centered barriers, 2) provider-centered barriers, and 3) system-centered barriers (Odedosu, Schoenthaler, Vieira, Agyemang & Ogedegbe, 2012). Patient-centered barriers include medication non-adherence, lack of physical exercise and consuming diets that contribute to hypertension. Provider-centered barriers include limited patient-provider communication regarding lifestyle changes, lack of adherence to established guidelines for HTN management and resistance to change. Systems barriers are inclusive of but not limited to access to care, medication costs, and lack of health care coverage (Khatib et al., 2014). When considering a plan of care, systems barriers should be a part of the equation in certain geographical areas. Racial disparities in health care lead to disproportionate mortality and morbidity in rural areas.

Rurality

Patients often seek medical attention for chronic conditions from their primary care providers. Geographic location can influence patient outcomes (Durant et al., 2012). Rurality adds to the burden of HTN in AAs. Health care disparities such as ethnicity, poverty and access to care are all associated with Rurality and contribute to the higher incidence of HTN in AAs. For example, barriers to health care in rural communities include transportation, lack of health insurance, and lack of health care facilities and providers, all of which contribute to limited access to health care. As a result, rural communities have a higher incidence of chronic diseases such as HTN (Murphy, McAllister, Weir, Tjosvold & Eurich, 2014) and have poorer outcomes

(Durant et al., 2012).

Health Care Policy

As previously mentioned, a major problem for rural communities is access to health care. Improving access to health care for rural America is a priority. The National Rural Health Association (2007) has developed a timeline for the Affordable Care Act, which is designed to address the issues pertaining to access to health care. Provisions on the timeline include workforce improvement, payment reimbursement, and requirement of the electronic health record requirements, to name a few. Student loan repayment programs for those working in rural or underserved areas and improving Medicare and Medicaid reimbursement in rural practices are some specific provisions that have been implemented to improve access to health care in rural communities.

Purpose

The purpose of this study is two-fold: 1) to determine the degree of adherence with national guidelines in the pharmacologic selections used to control blood pressure in AAs, and 2) to determine if adherence equals better blood pressure control. What is the adherence rate of health care providers to national, evidence-based guidelines in prescribing antihypertensive medications to the rural AA hypertensive population?

Review of Literature

Methods

An extensive online Boolean search using PubMed, CINAHL, EBSCOhost, Google Scholar, and Ovid was conducted to evaluate provider adherence with national evidence-based guidelines in the treatment of hypertensive AAs. The Seventh Report of the Joint National Committee on Prevention Protection, Evaluation and Treatment of High Blood Pressure (JNC 7)

was chosen as the national guidelines for comparison. No date restrictions were imposed in an effort to collect all relevant data. The search was conducted using the key words “African Americans” and “hypertension” and “JNC 7” and “providers.” A three-step process was then used to select potential articles germane to the health issue. First, articles were selected based on their titles that included antihypertensive therapy in AAs, gaps between guidelines and clinical practice and physician adherence to HTN guidelines. The initial search yielded 24 articles. During the second step, the abstracts were read to determine if articles were relative to this research. Eight of the 24 articles were excluded at that point. Exclusion criteria included articles that were patient barrier focused, those that did not include provider barriers, and articles that did not use JNC 7 guidelines of any version.

The articles were then reviewed in their entirety and the following inclusion criteria were used to select articles: a) discussion of the need for culturally tailored pharmacological treatment of HTN in AAs, b) JNC 7 guidelines used as a guide for provider choice of medications, c) physician adherence to guidelines, and d) studies that examined the effects of provider non-adherence to treatment standards. Six of the remaining 16 articles met the inclusion criteria for this review. The studies are further categorized in Table 1 in the appendences.

Background Studies

Patient barriers to controlling hypertension. The rates of HTN, prevalence and associated mortality are alarmingly high in the AA population. Several patient-related barriers are considered contributing factors and they include modifiable factors, such as medication nonadherence, poor knowledge of the disease process and the consequences of not controlling it, an unwillingness or inability to modify lifestyle and unrealistic expectations of treatment

(Odedosu et al., 2012). Other patient-centered barriers are more difficult, if not impossible, to modify, such as socioeconomic status, educational level, sex and age.

Systems barriers to controlling hypertension. Systems related barriers are those that occur within the healthcare system as a whole. Access to care tends to be the system related barrier that is most identified (Odedosu et al., 2012). Major contributors to poor access to care in the AA population include lack of education and low income. In 2009, blacks were less likely to successfully complete degrees beyond high school (United States Department of Commerce, 2013). According to the United States Department of Commerce (2013), 25.8% of AAs were below the poverty level in the years 2007-2011compared to whites at 11.6%. These misfortunes make gaining access to health care challenging.

Provider barriers to controlling hypertension. As previously identified by Odedosu et al., (2012), provider-related barriers include unwillingness to change practice habits, not being up-to-date with the current guidelines and practices, and nonadherence to evidence-based guidelines. The latter is the focus of this study: provider adherence to JNC guidelines, specifically JNC 7, in the treatment of hypertensive AAs. Are providers adhering to the JNC 7 guidelines when considering pharmacological treatment regimens for AAs, and if so, are they effective?

Provider-patient communication. Numerous studies have been conducted to evaluate provider-related barriers to quality health care. For example, studies have evaluated patient-provider communication as a barrier to quality healthcare. Schoenthaler et al. (2009) conducted a study on patients' perceptions of provider communication regarding medication adherence. The study was conducted in New York in a community-based healthcare setting with 439 participants with uncontrolled HTN. Patients used a questionnaire to rate provider communication while

medication adherence was measured using a self-reported Morisky scale. The study concluded that more collaborative communication resulted in better medication adherence.

Cook et al. (2006) examined provider awareness and responsibility to recommend lifestyle modification. The study participants consisted of 251 providers in various hierarchies of healthcare providers in 72 Midwest community clinics and it explored the beliefs of the providers regarding barriers to HTN and hyperlipidemia control. Cook et al. (2006) found that providers lacked confidence to address behavioral change and identified hindrances to modifying patient lifestyle. Providers in this study emphasized medical adherence over lifestyle changes. Finally, the findings suggest a knowledge deficit among some of the providers as indicated by their lack of understanding regarding the guidelines and their lack of confidence in addressing lifestyle modification.

Current State of Knowledge

Consequently, few studies have assessed whether providers are putting research into practice by adhering to national guidelines such as those recommended by JNC in the treatment of hypertensive AAs. According to JNC 7, AAs demonstrate a reduced blood pressure (BP) response to monotherapy with beta-blockers (BBs), angiotensin-converting enzyme inhibitors (ACEIs), or angiotensin-receptor blockers (ARBs) when compared to diuretics and calcium channel blockers (CCBs) (Chobanian et al., 2003). In addition, JNC 7 reported that the adverse effects of ACEIs occur two to four times more in AAs than in other groups, thus contributing to medical nonadherence. Therefore, the initial drug therapies recommended by JNC 7 for AAs, based on evidence-based practice, are CCBs or diuretics, specifically thiazide diuretics (TDs) (Chobanian et al., 2003).

In the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) study, CCBs were recommended over ACEIs in AAs because the use of ACEIs in this population was associated with a 40% increase in the rate of strokes among participants. Further, JNC 7 provides a follow-up plan for the frequency of office visits if blood pressure is not controlled, which is to re-evaluate one month after initial therapy. If blood pressure is not controlled, add a second agent with monthly follow-up. If it is necessary, add a third agent. If unable to control BP, refer to a HTN specialist. Finally, JNC 7 recommends against prescribing an ACEI and an ARB to the same patient simultaneously (James et al., 2014).

Guideline Adherence Studies

The Jackson Heart Study by Harman et al. (2013) found that TDs were used more than CCBs and those taking TDs were more likely to have better controlled BP in the general AA population. Despite findings that suggest monotherapy with CCBs is effective, those taking CCBs were less likely to be at their goal blood pressure than those taking TDs. Further findings support JNC 7's summary statement regarding better responses with dual therapy that includes a diuretic. A drug regimen with a TD and another drug class was more effective in this AA population-based study than monotherapy with ACEI, ARB, or beta blockers (BBs) (Harman et al., 2013). This also held true in patients with a comorbidity of DM. These findings suggest that providers are adhering to the JNC 7 guidelines in medication choices for this population and that the recommendations are effective in treating HTN in AAs, including those with a comorbidity of DM.

In a study by Etuk, Isezuo, Chika, Akuche, and Ali (2008) the records of 145 hypertensive Nigerians were reviewed to determine physician adherence with recommended guidelines, their pattern of prescribing and the effects on blood pressure control. Diuretics were

prescribed more than CCBs either as monotherapy (44.8%) or in combination with other drugs (88.8%). However, CCBs were more effective as monotherapy than diuretic monotherapy in lowering blood pressure. The mean reduction in systolic blood pressure with CCBs was 28.57 mmHg and a diastolic reduction of 12.86 mmHg. In comparison, diuretic systolic reduction was 11.57 mmHg and diastolic was 4.44 mmHg. Combination therapy was also more effective than monotherapy in decreasing both systolic and diastolic blood pressure with a mean decrease in systolic blood pressure of 32.64 mmHg compared to 15.43 mmHg with monotherapy and a mean diastolic blood pressure reduction of 18.56 mmHg compared to 6.96 mmHg with monotherapy. Additionally, providers were adherent to the recommendations of JNC 7 as evidenced by 1) diuretics were used as first line therapy, 2) low incidence of prescribing ACEIs or BBs as monotherapy and, 3) combination therapy that was inclusive of diuretics. Similarly, ACEI were highly prescribed in the patients with comorbidities such as DM, which is also within the recommended guidelines. An additional finding was that blood pressure control was better with adequate follow-up office visits. A principal limitation of this study was its retrospective nature.

The results of the study by Peck et al. (2013) support JNC 7 guidelines in the treatment of HTN in AAs and corroborate the findings that ACEI monotherapy may not be as effective in AAs as in Caucasians. This study was a meta-analysis of 13 trials that compared effectiveness of ACEIs between AAs and whites. Compared to the Caucasian population, AAs experienced a lower reduction in systolic blood pressure (4.6 mmHg) and in diastolic blood pressures (2.8 mmHg) on ACEIs. A final conclusion is that CCBs or TDs may be more beneficial than ACEIs as monotherapy in the AA population. There were three study limitations. First, the study was done in the USA, which may not be representative of other countries. Second, the collected data

results were not individualized. Lastly, other factors such as diet, sodium intake and hormone levels were not considered.

A study by Peters, Benkert, Butler, and Brunelle (2007) used the Hypertension Quality Chart Review Index (HQI) to review the charts of 128 hypertensive AA patients. Provider pharmacologic adherence was found to be 76%. A diuretic regimen was prescribed to 81% of the population and ACEI or ARB therapy was prescribed to 88% of the patients with DM or chronic kidney disease (CKD). According to JNC 7, HTN is further divided into stages: stage 1 and stage 2 (Table 3). Patients with stage 2 HTN on two antihypertensive medications accounted for 93% of all patients with HTN. Additionally, physicians were more likely to adjust medications than nurse practitioners when blood pressure was not at goal. Further findings concluded that provider adherence to follow-up was 80%. Adherence to appropriate follow-up recommendations was associated with achieving blood pressure goals ($P<0.05$). Finally, even though provider adherence to JNC 7 guidelines overall was high, it did not lead to optimal blood pressure levels. Study limitations included the following: 1) there was bias as a result of small number of returning patients, 2) completion of HQI was time-intensive, and 3) the data were obtained from documented data, which potentially reflects time and documentation limitations.

Guideline Nonadherence Studies

Gerber et al. (2013) evaluated provider diuretic prescribing practices for 658 AAs that were selected from a home care population. Interviews were conducted with the participants to discuss drug regimens. Only 46% of these participants were taking diuretics. JNC 7 recommends diuretics or CCBs as initial therapy in AAs. If blood pressure is not controlled with this regimen, additional drugs should be added (Chobanian et al., 2003). If patients in this study were taking CCBs as an acceptable alternative to TD, there were still 31.5% not taking either. Further, those

with stage 2 HTN taking more than 3 drugs still were not on a diuretic. In terms of effectiveness in lowering of blood pressure, diuretics were associated with lowering both systolic and diastolic blood pressure by 5 mmHg and 3.79 mmHg, respectively. These findings suggest provider nonadherence to JNC 7 guidelines but that adherence to the guidelines is effective in controlling HTN in this population. In addition to the aforementioned findings, blood pressure goal achievement was associated with follow-up visits. The study yielded four significant limitations: 1) a single home health agency was studied, 2) participants were limited to only AAs with uncontrolled HTN, 3) the study only investigated a single cohort, and 4) the study was limited to a particular time frame.

In spite of the JNC 7 recommendations that TDs or CCBs are more effective in blood pressure control for AAs, a study by Odigie-Okon, Zarich, Okon, and Dufresne (2010) found that providers were nonadherent to these guidelines. There were 416 participants in this study and of that total number, 212 (50.9%) were at their goal blood pressure. Of that population, 194 (91.5%) were prescribed ACEIs as monotherapy, presenting a discrepancy with other studies and calling into question the aptness of therapy based on JNC 7 guidelines. Additionally, the study had concerns regarding the underutilization of CCBs and diuretics in AAs with DM. In comparison to those without compelling indications, those with compelling indications were less likely to be at goal (70% vs. 57% respectively). Those with DM were less likely to achieve target blood pressure. Diabetics were more likely to be prescribed an ACEI, which is recommended by JNC 7. Additionally, the study found that older patients were more likely to be prescribed CCBs and BBs and their BP was harder to control. Despite the nonadherence to the recommended guidelines, blood pressure control in this study was impressive with close to 51% being controlled. The inability to determine impact of modifiable lifestyle factors such as diet and

exercise may contribute to this inconsistent finding. Other study limitations included: 1) blood pressure readings limited to a single nonstandardized reading, 2) inability to determine patient adherence, which may impact blood pressure control and 3) lack of documentation of comorbid conditions, which may have contributed to partiality.

Conclusions

The results of this literature review have several implications. Predominantly, these studies suggest the majority of providers were adherent to the JNC guidelines in their choice of pharmacological regimens. Four of the six studies concluded provider adherence. Second, improved blood pressure control was exhibited in 4 of the 6 studies. Interestingly, one of the studies found BP goals were met despite provider nonadherence to the guidelines. Additional findings suggest adequate office visit follow-up contributes to better blood pressure control. Lastly, physicians were more aggressive in medication adjustments than nurse practitioners.

Implications for Providers

What is the adherence rate of providers to national, evidence-based guidelines in prescribing antihypertensive medications to the rural AA hypertensive population? The study was conducted to assess and understand the scope of provider adherence to national guidelines in the treatment of HTN in AAs. The findings indicate several important facts: 1) there is limited research that has been done on provider adherence to JNC 7 guidelines in the treatment of HTN in AAs, 2) JNC 7 guidelines may be effective in treating HTN in this population, 3) provider education is needed to ensure up-to-date, evidence-based care is provided to patients, and 4) better patient outcomes are needed. The latter, improving patient outcomes, is important if we are to reduce the prevalence of uncontrolled HTN in the AA community, improve quality of life, reduce the mortality rate of HTN-associated deaths and decrease the extensive financial burden.

Lastly, implications for the use of theoretical frameworks, such as Donabedian's quality care framework, enable researchers to systematically work through healthcare issues.

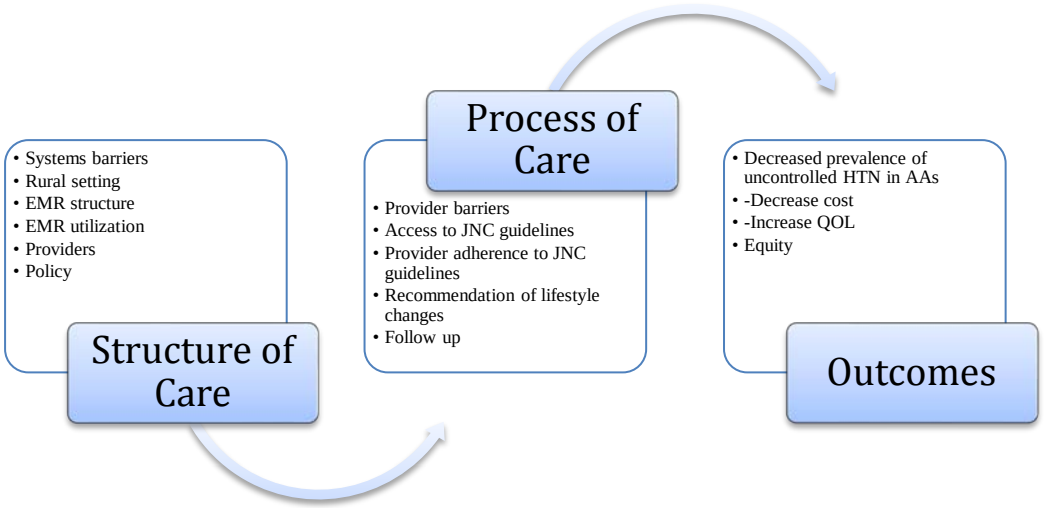
Methods

Theoretical Framework

"Theory gives planners tools for moving beyond intuition to design and evaluate health behavior and health promotion interventions based on understanding of behavior" (Rimer & Glanz, 2005, p. 4). The theoretical framework of Avedis Donabedian was used as a tool to guide this research. His framework was used to assess the quality of care provided in healthcare. The three components that form the foundation of this theory are 1) structure of care, 2) process of care, and 3) outcomes. The concept is grounded on the principle of healthcare outcomes as a result of the medical care provided by medical professionals (McDonald et al., 2007).

Donabedian (as cited in McDonald et al., 2007) describes structure of care as any process that relates to the organizational and physical aspects of care settings. A few specific examples of this process are facilities, equipment, and operational and financial processes supporting medical care. The second component of this framework is process of care. Process of care is dependent upon the structures of care to supply resources and methods that are necessary for participants to carry out patient care activities. Patient-provider communication, practice habits and care management are all examples of process of care. Further, the goal of process of care is to improve patient health by promoting recovery, patient survival and even patient satisfaction (McDonald et al., 2007). The final concept of this model, outcomes, is simply the patient outcomes based on medical health after the application of the two previous components (McDonald et al., 2007). Figure 1 depicts the components of Donabedian's theory and how it is applicable to this study.

Figure 1. Application of Donabedian's Quality Care



The application of Donabedian's theory of quality care is ideal in assessing this healthcare problem. From a structural perspective, the EMR was utilized to identify AA patients who had HTN or uncontrolled blood pressure. The use of the EMR can also aide in the decision-making process for providers in an effort to provide quality care. The EMR database is limited to the past 5 years. Therefore, the data regarding onset of HTN diagnosis and initial medication regimens at onset of diagnosis was limited. During the retrospective review, identification of the structure of the EMR was also evaluated. The EMR allows providers to order and review laboratory results, track or graph BP readings, print lifestyle modification handouts, schedule appropriate follow-up appointments and provide access to evidence based resources such as the up-to-date databases and JNC guidelines.

Patient access to the physical structure and providers was also reviewed. During the time of this study, office hours were limited to Monday through Friday from 9 AM to 5 PM. There was no weekend or evening hours to accommodate the 9 to 5 working population, which limits access to care. However, the office does provide on-call physician service. Although the patient

may not be able to speak to their primary care provider, the on-call provider has access to the patient's record via the EMR to ensure continuity of care.

The second component of Donabedian's framework, process of care, is evident in JNC guidelines as the necessary resources and tools required by providers to provide quality patient care decisions. The areas assessed and reviewed include:

- Provider barriers
- Access to JNC guidelines
- Provider adherence to JNC guidelines
- Recommendation of lifestyle changes
- Follow-up

Provider-based barriers impede of quality health care. A major provider barrier is nonadherence to evidence-based treatment guidelines. Providers' lack of knowledge of the current, most up-to-date information and recommendations in addition to reluctance to change are significant provider barriers to quality care and control of HTN (Odedosu et al., 2012). The JNC of HTN provides such evidence-based practice recommendations for the treatment of HTN in the general hypertensive population. Further, specific recommendations for the AA population that differ from the general population have been identified. These evidence-based recommendations were designed to take HTN control in AAs in a different direction with the goal of improved blood pressure control in this population (Chobanian et. al, 2003). Providers may have a number of reasons for not following the guidelines. They may not agree with the guidelines, they may not intensify treatment if goals are not met or they simply may have no desire to change the way they practice (Odedosu et al., 2012). Whatever the reason, these are barriers to HTN control. Using the Donabedian quality of care framework, this study was

conducted to evaluate the extent of provider adherence to evidence-based national guidelines in the treatment of AAs with HTN.

A discussion session with the providers involved in the study was initiated in a pilot study format. The discussions centered on the JNC 7 guidelines and if they used the guidelines in deciding medication therapy, lifestyle modifications and follow-up in AA hypertensive patients. Two physicians and one nurse practitioner (NP) were interviewed. One physician commented that he was aware of the guidelines but he relied more on his numerous years of experience as a family medicine provider than on the guidelines. The other physician reported that she is aware of the guidelines but frequently uses other evidence-based practice sites as guides. The NP reported being aware of the guidelines but did not rely solely on the guidelines for guidance in treating HTN in AAs. None of the providers reported referring patients to a specialist when blood pressure was not controlled. They all reported that they discussed lifestyle modifications to assist in blood pressure control and believed follow-up was adequate. Finally, the EMR was reviewed to assess adherence with the JNC 7 guidelines.

The final component of Donabedian's model includes outcomes. As a result of improvement in the process of care, improvement in the following patient outcomes is expected: 1) decrease in the prevalence of HTN in the AA community, 2) decrease in the mortality rate of HTN- related diseases, 3) decreased in the cost for HTN-related illnesses and 4) improvements in the quality of life of these patients. For the purpose of this study blood pressure control outcomes were assessed and reported using percentages.

Study Design

A retrospective review of the EMR was conducted to identify hypertensive AA patients in a rural clinic who were seen from July 1, 2014 to August 31, 2014. A descriptive, pre-

experimental, quantitative method was used to evaluate the degree of provider adherence to national HTN guidelines in AAs living in a rural community. A modified version of the HQI tool was used to document the pharmacological findings (see Table 2 in the appendices). Inclusion criteria for the patients included (Figure 2):

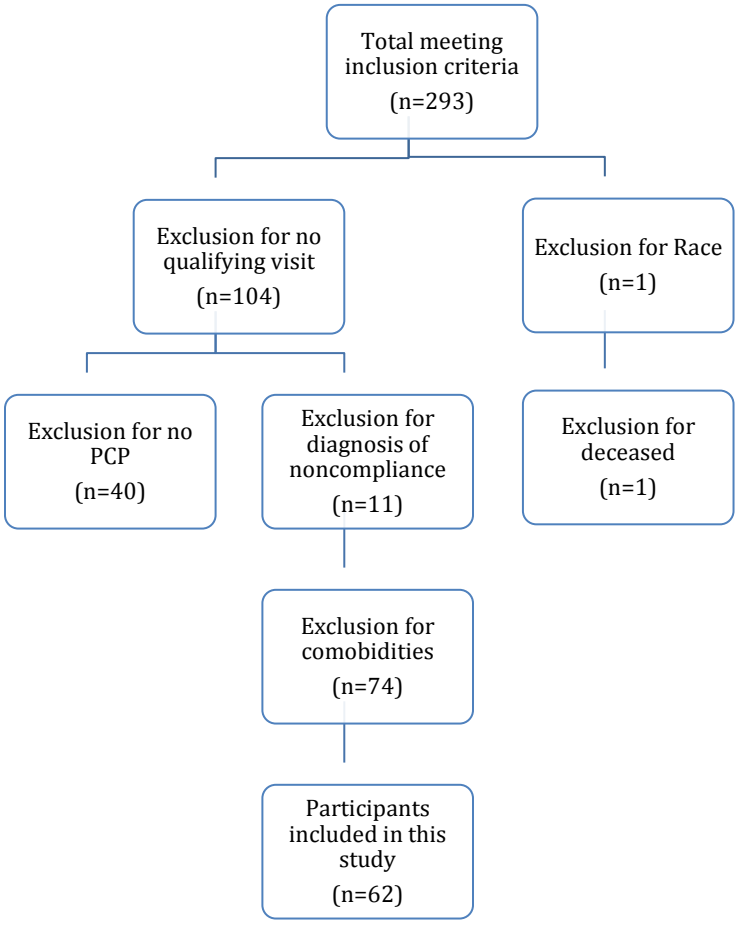
- Age 20 to 80 years
- AAs with a diagnosis of HTN
- Receiving antihypertensive medications

Exclusion criteria included:

- Specific end organ damage (i.e., CKD, stroke, cardiomyopathy or myocardial infarctions)
- Age younger than 20 or greater than 80 years old
- No office visits during research dates or office visits for reasons other than HTN
- No established relationship with a single primary care provider (PCP)
- Diagnosis of medical nonadherence
- Race other than AA
- Deceased patients

A sample of 62 participants met the inclusion criteria.

Figure 2. Participant Selection Algorithm



Study Setting and Sample

The study was conducted at a multi-physician practice located in a rural community. The practice serves the Eastern Shore of Virginia with a population of 45,273, 63.8% of which are AAs (U.S. Department of Commerce, 2014). The practice accepts Medicare, Medicaid, private insurances and the indigent. The practice serves pediatric to geriatric patients. There are four primary care providers, one cardiologist, two pulmonologist, one neurologist and one podiatrist. Primary care providers were the focus of this study. The study aims to assess health care provider adherence to JNC hypertensive guidelines in AAs.

Data Collection and Procedures

The primary source data were selected from the EMR Centricity developed by General Electric Healthcare. An EMR is a digital or electronic version of a paper chart that contains the patient's medical history. The EMR was reviewed to identify onset of HTN if feasible, provider selection of anti-hypertensive drugs for initial treatment and additional drug choices. HTN was defined as a blood pressure >140/90 mmHg in the general population and >130/80 mmHg in hypertensive individuals with a comorbidity of DM in accordance with JNC 7. Patients who met the inclusion criteria were selected by convenience sample. A list of those patients was composed and each was assigned a research identifier. A sample size of 62 participants met the inclusion criteria. Demographic variables assessed included age, gender, marital status, and insurance coverage. Other variables that were considered include the following antihypertensive drug classes; a) thiazide diuretics, b) angiotensin-converting-enzyme inhibitors (ACEIs), c) angiotensin II receptor blockers (ARBs), and d) calcium channel blockers (CCBs). Evaluation of monotherapy and combination therapy was also performed.

Protection of Human Subjects

In an effort to protect human subjects, this proposal was submitted to the Institutional Review Board for Health Science Research (IRB-HSR) of the University of Virginia (UVA) and Riverside Medical Group (RMG) for approval of the research. RMG approved this research study as an exempt study. Please see Appendix A. UVA has determined that because no UVA personnel were working as agents on this study, no approvals from the UVA IRB-HSR were required. Please see Appendix B for the determination of UVA agent form.

Measures

JNC 7 (as cited in Chobanian et al., 2003) describes HTN as a systolic blood pressure > 140 mmHg or a diastolic blood pressure of > 90 mmHg in the general population, including AAs. If the patient has a comorbidity such as DM, a systolic blood pressure > 130 mmHg and a diastolic blood pressure of > 80 mmHg is considered suboptimal in the treatment of HTN. The coexistence of HTN and DM further increases the risk of vascular complications such as strokes, and renal disease, which is why the optimal blood pressure goal is lower (Chobanian et al., 2003).

Diagnostic measurements for the classification of HTN were performed based on JNC 7 guidelines (Table 3). According to JNC 7, two consecutive readings in contralateral arms at least 5 minutes apart while sitting are categorized as HTN. JNC 7 describes the stages of HTN. A normal blood pressure is a systolic blood pressure of <140 mmHg and a diastolic of <90 mmHg. stage 1 is a systolic blood pressure reading of 140 to 159 mmHg or a diastolic BP reading of 90 to 99 mm Hg. Stage 2 is classified as a systolic blood pressure $\geq$160 mm Hg and a diastolic reading of $\geq$100 mmHg. In the general AA population, initial monotherapy with diuretics, specifically TDs or CCBs should be used for stage 1 HTN or a diuretic in combination with other drug classes for combination drug therapy regimen for stage 2 HTN. JNC 7 recommends specialty referrals if blood pressure is not controlled after maximizing three medication classes, with one being a TD. Lastly, those with compelling indications, such as those with a comorbidity of DM, ACEIs are recommended to reduce strokes and other vascular complications (Chobanian et al., 2003).

Table 3. Joint National Committee Classification of Blood Pressure for Adults

Blood Pressure Classification	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Normal	<120	and <80
Prehypertension	120-139	or 80-89
Hypertension	≥140	≥90
Stage 1 hypertension	140-159	or 90-99
Stage 2 hypertension	≥160	or ≥100

In regards to follow-up, JNC 7 recommends a monthly follow-up office visit if blood pressure is not at goal and every 3 to 6 months if BP is at goal. Laboratory values for potassium and creatinine should be obtained 1 to 2 times annually and patients with a comorbidity of DM should have their urine microalbumin levels ordered at least annually. Patients newly diagnosed with HTN should have a urinalysis, blood glucose, hematocrit, potassium, creatinine, calcium and lipid profile drawn prior to beginning pharmacological treatment.

JNC 7 recommends lifestyle modification education. Better outcomes have been found when lifestyle modification is incorporated into the plan of care. See Appendix D for the specific parameters of these recommendations. The following are the areas recommended for lifestyle modification:

- Weight loss.
- Following the Dietary Approaches to Stop Hypertension (DASH) diet, which consists of a diet rich in fruit and vegetables, low fat dairy products, and reduced intake of saturated and total fat.

- Adhering to sodium restrictions.
- Regular physical activity.
- Limiting alcohol consumption.

Data Analysis

Statistical analyses were performed on the outcomes of blood pressure control in participants who were prescribed antihypertensive medications based on JNC 7 guidelines compared to those who were not and also on blood pressures that were at goal and those that were not. Additionally, outcomes of provider adherence to the guidelines were measured based on adherence to medication choice recommendations, documented lifestyle modification recommendations, laboratory studies and follow-up for patients with HTN and HTN with a comorbidity of DM. Analysis has been conducted using standard statistical methods and reported as percentages to describe the results. Additionally, a chi square analysis was performed to determine if there is a relationship between provider adherence and blood pressure outcomes.

Findings

Results

The demographic characteristics of the 62 participants are described in Table 4. Of the 62 patients studied, 41.9% (n=26) were male and 58.1% (n=36) were female. Patient age was divided into 2 categories; less than 65 years and 65 and older. There were 50% (n=31) patients in each age group. The mean age was 62.8 years. The most frequent stage of uncontrolled HTN was stage 1 accounting for 84.4% (n=27) of the 32 patients. Stage 2 HTN was detected in 15.6% (n=5) of the patients. There were 16 nondiabetic patients who's BP was not at goal. Of those 16, 81% (n=13) had stage 1 HTN and the remaining 19% (n=3) had stage 2 HTN. In patient's aged less than 65 years, 45.2% (n=14) of the 31 patients had Stage 1 HTN and 12.9% (n=4) had stage

2 HTN. In the age group of 65 and over, stage 1 accounted for 41.9% (n=13) of patients and stage 2 HTN accounted for 3.2% (n=1). Medicare coverage accounted for 56.5% (n=35) of the study participants. Blue Cross Blue Shield (BCBS) accounted for the second most utilized health insurance with 24.2% (n=15) of the patients enrolled. Medicaid, self-pay and private insurances each accounted for 6.5% (n=4) of the patients.

Table 4. Demographics

Gender		
	Frequency	Percent
Male	26	41.9
Female	36	58.1
Total	62	100.0
Age		
	Frequency	Percent
<65 years	31	50.0
≥65	31	50.0
Total	62	100.0
Stages of Hypertension		
	Frequency	Percent
Stage 1	5	8.1
Stage 2	27	43.5
Controlled	30	48.4
Total	62	100.0
Marital Status		
	Frequency	Percent
Married	19	30.6
Divorced	6	9.7
Single	14	22.6
Widowed	8	12.9
Undetermined	15	24.2
Total	62	100.0
Insurance		
	Frequency	Percent
Medicare	35	56.5
Medicaid	4	6.5
BCBS	15	24.2

Self-pay	4	6.5
Private	4	6.5
Total	62	100.0

Pharmacologic Treatment

Drug therapy regimens are reported in Table 5. Of the 62 patients studied, 12.9% (n=8) were on monotherapy and 87.1% (n=54) were on combination therapy. Combination therapy is described as taking two or more medications. Those with a comorbidity of DM accounted for 53.2% (n=33) of the 62 patients. JNC 7 guidelines suggest patients with a comorbidity of DM should take ACEIs to decrease morbidity and mortality. Of the 33 diabetic patients, only 69.7% (n=23) were taking ACEIs as recommended. TDs or CCBs were not prescribed in any of the eight patients on monotherapy. Of the 54 patients taking combination therapy, 87% (n=47) were taking either a TD or CCB. In the patients studied, 53.2% (n=33) of the 62 warranted medication adjustments as a result of uncontrolled blood pressure. Only 15.2% (n=5) had medication adjustments, leaving 84.8% (n=28) inadequately treated. One patient (1.6%) required a referral to a HTN specialist as a result of maximizing three different medication classes, including a TD. That patient was not referred.

Table 5. Medication Regimen

Monotherapy with TD or CCB (n=8)		
On TD or CCB	Frequency (n)	Percent
Yes	0	0
No	8	100
Total	8	100.0
Combination Therapy with TD or CCB (n=54)		
Yes	47	87.0
No	7	13.0

Total	54	100.0
ACEI if comorbidity of DM (n=33)		
Yes	23	69.7
No	10	30.3
Total	33	100.0

Abbreviations: TD, thiazide diuretic; CCB, calcium channel blocker; ACEI, angiotensin converting enzyme inhibitor; DM, diabetes mellitus.

In the eight patients on monotherapy, 37.5% (n=3) of them met their blood pressure goal despite not being on a TD or CCB. Of the 54 patients on combination therapy, 87% (n=47) were on a TD or CCB as recommended by JNC 7. Of those 47 patients, 55.3% (n=26) achieved goal blood pressures. A chi square test was used to determine if there is a relationship between being prescribed JNC 7 medication regimen and blood pressure outcomes. There was no significant relation between taking the recommended TD or CCB and blood pressure control (X2=. 0; P=. 99).

Lifestyle Modifications

The categories examined under lifestyle modifications included DASH diet, weight loss, sodium restrictions, physical activity and alcohol consumption. Only 6.5% (n=4) of the 62 patients had documentation of provider recommendations for the DASH diet and alcohol consumption. The DASH diet includes recommendations for limiting alcohol consumption. Weight loss, sodium restriction and physical activity recommendations were documented in 82.3% (n=51) of the patients. This is due in part to the Smart plan (see Appendix C) that is inclusive of these three lifestyle modifications.

Follow-up Care

JNC 7 recommends follow-up every 3 to 6 months if BP is controlled. Providers were adherent with follow up recommendations 96.6% (n=28) of the time in the 29 patients with controlled blood pressure. In the remaining 33 patients who required monthly follow-up due to uncontrolled blood pressure, providers were only 9.1% (n=3) adherent to the recommendations.

Laboratory Recommendations

Providers were adherent to obtaining laboratory tests prior to initiating treatment in 0% of the two patients with new diagnoses of HTN. The adherence rate for biannual laboratory tests in patients with historical diagnosis of HTN was 65% (n=39) of the 60 qualifying patients. In patients with a comorbidity of DM, JNC 7 recommends annual urine micro albumin levels. Providers were 15.2% (n=5) adherent to the guidelines in the 33 diabetic patients.

Providers

Physicians accounted for 64.5% (n=40) of the providers in this study. Nurse practitioners (NPs) accounted for 35.5% (n=22). Of the 29 patients with blood pressure at goal, a physician was the provider in 75.9% (n=22) of the office visits while NPs provided care in 24.1% (n=7) of the visits.

Discussion

Endless and organized activities that result in measurable improvement in healthcare services and targeted patient outcomes have been described as QI (U.S Department of Health and Human Services, 2011). The way care is delivered is related to quality. The U.S Department of Health and Human Services (2011) identified the 4 principles of quality improvement (QI) as 1) QI work as systems and processes, 2) focus on patients, 3) focus on being part of the team, and 4) focus on use of data. QI work as systems and processes refers to resources and activities that are

carried out and are evaluated simultaneously to improve quality of care or outcomes (U.S Department of Health and Human Services, 2011). This is modeled after Donabedian's framework for quality improvement. This study focused on the systems or structural components of systems barriers such as the rural setting the study was conducted in, EMR structure, EMR utilization, providers and policy. Activities assessed included provider barriers, access to JNC 7 guidelines, provider adherence to those guidelines, recommendation of lifestyle changes, laboratory assessment and follow-up.

Evaluation of the first 2 components is necessary to produce or improve patient outcomes. Outcome goals include decreasing the prevalence of uncontrolled HTN in AAs, decreasing cost associated with HTN, increasing quality of life, and equity. This study was conducted to assess what is currently being done in this rural primary care setting to address the increased prevalence and mortality of HTN in AAs. Using the methodical framework of Donabedian, both quantitative (frequencies) and qualitative (descriptive) were collected and analyzed to assess the current system and to identify areas for improvement. The practice guidelines of JNC 7 were used as performance measures for comparison.

The JNC conducts and analyzes evidence-based studies periodically. Subsequently, JNC formulates recommendations based on those findings. The National Heart Lung and Blood Institute (NHLBI) traditionally have endorsed previous versions. Controversy surrounding the Eighth Report of the Joint National Committee (JNC 8) has led to NHLBI not endorsing JNC 8 (Bauchner, Fontanarosa & Golub, 2014). Other federal organizations have also declined to endorse the new recommendations. The controversy surrounds the increased BP goal of <150/90 in patients age >60 and a goal of <140/90 for those age 18 to 60, including those having

comorbidities of DM and CKD. JNC 8 guidelines were avoided for this study due to this controversy and its relatively new release.

There are several main findings of this study. First, the first line drug choice as monotherapy in the treatment of HTN in AAs should be TDs or CCBs, as recommended by JNC 7. While there were only eight patients receiving monotherapy, none of them were on TDs or CCBs, which indicates 100% nonadherence to the guidelines regarding monotherapy. In fact, the majority of the patients on monotherapy were on ACEIs, while the remaining were on ARBs. Albeit, studies have found ACEIs and ARBs are less effective in the AA population. In contrast, providers were more consistent with the guideline recommendations in AAs on combination drug therapy. Provider adherence was documented in 87% of the patients receiving combination therapy. Less than half of the 62 patients in this study have at goal BP readings at the level recommended by JNC 7. Medication adjustments were not made in 18% of the 33.2% that required adjustments. This could be a contributing factor to patients not meeting their BP goal. However, there was no correlation between BP control in those patients prescribed the recommended medications and those that were not. Additionally, provider adherence in prescribing ACEIs in patients with a comorbidity of DM was seen in 70% of the population. Studies have shown that the use of ACEIs in this population decreases mortality and morbidity by decreasing end organ damage and cardiovascular incidents.

Lifestyle modification, as an adjunct to pharmacologic therapy, has been associated with better BP control. Provider adherence to alcohol consumption and DASH diet recommendations were poorly documented. Detailed recommendations for the DASH diet and alcohol were only documented in 4 of the 62 EMRs. Adherence was high in the recommendations for physical

activity, weight loss and sodium restrictions. The Smart plan is inclusive of these 3 recommendations, which was documented in 51 of the 62 patients.

Patient adherence with adequate office visit follow-up has been known to yield better BP control. JNC 7 recommends an office visit follow-up every 3 to 6 months in patients with BP at goal and monthly for those who are not at goal. Provider adherence was evident in the 3 to 6 month follow-up population (97%). A monthly follow-up recommendation for those with uncontrolled BP was poorly represented in this study.

Uncontrolled BP can lead to end organ damage such as renal insufficiency or failure, heart attacks or strokes. Further, the medications used to treat HTN can have adverse effects on other organs. JNC 7 recommendations include a urinalysis, blood glucose, hematocrit, potassium, creatinine, calcium and lipids in patients newly diagnosed with HTN before initiating therapy. Due to the limitations of the EMR, only 2 patients were identified as newly diagnosed. Of these patients, neither of them had laboratory testing performed prior to starting treatment. Diabetics should have a urine microalbumin level annually. Only 15% of diabetics had documented microalbumin levels within the preceding 6 months.

Strengths and Weaknesses of the Study

This study had advantages and disadvantages. The advantages of this study included:

- A sample from a rural clinic actively treating a large AA population.
- The potential to guide future strategic interventions to implement change.
- The potential for yielding implications for APN practice.
- An initial evaluation that may lead to the development of a tool.
- An application of Donabedian's framework that will enhance knowledge of processes and structures in place, which identifies areas for change.

- The findings will be useful and specific to this practice and population, whereby fostering evidence-based practice (EBP).
- Raised awareness of the guidelines.

Disadvantages include the following:

- Patient nonadherence may be a contributing factor to outcomes.
- The EMR data was limited to the last 5 years.
- The EMR may not reflect lifestyle modification recommendations.
- The focus was on a single rural health clinic.
- The pre-experimental method.
- The non-experimental, convenience sampling poses numerous threats to validity.
- The study was conducted with a focus on AAs in a single rural clinic.
- The study population was a convenience sample.
- Blood pressure readings were gathered during a short specified time period.
- Some data may not have been available due to limited documentation within the EMR.

Future Implications

Of the 33 patients who required medication adjustments due to uncontrolled HTN, only five patients received medication adjustments. Future implications include medication adjustments for patients whose blood pressure is not at goal. Second, the one patient that was taking three medications at maximum dosages and therefore qualified for referral to a cardiologist or specialist was not referred. Appropriate identification and referrals to specialist are considerations for future practice. In addition, 28 (45.2%) of the 62 patients were on three or more medications but as previously mentioned, only one patient was on maximum dosages of

three different drug classes. For future prescribing habits, which adhere to the guidelines, providers should consider maximizing three medications from different drug classes, with one being a TD, prior to recommending additional drug classes.

There was no correlation between patients taking a TD or CCB as recommended by JNC 7 and blood pressure control. Patient noncompliance may be a contributing factor. Further, the study was conducted over a short time period. Future research should assess patient medication compliance and conduct longer studies.

Before we can assess and improve quality of care, there must be a general consensus on what parameters establish quality care (Donabedian, 1988). To address the issue of quality improvement, general guidelines must be established to ensure continuity of quality health care. National guidelines such as JNC 7 provide evidence-based recommendations to assist practitioners in the treatment of HTN. Such guidelines are nationally recognized because research has provided evidence that the recommendations improve health (Donabedian, 1988). While the practice of medicine is not solely dependent on recommendations or guidelines, these guidelines should be considered unless contraindicated in treating AAs with HTN in order to achieve the best outcomes.

Using Donabedian's quality improvement framework, provider adherence to the JNC 7 guidelines have been evaluated. The structure of care component assessed systems barriers, Rurality, EMR structure and utilization and provider access. In this rural community where disparities that challenge health care already exist, clinic access to care was limited due to lack of evening or weekend clinic hours. In addition, the EMR has the capability to aide providers in providing quality care if utilized to its maximum functionality. One limitation of the EMR in this study was its lack of direct access to JNC 7 guidelines.

The principal factor assessed in the process of care was provider barriers. Specific components of provider barriers include access to JNC 7 guidelines, provider adherence to JNC 7 guidelines, recommendation of lifestyle changes and follow up. Provider adherence to the guidelines overall was poor. Lack of documentation, provider-prescribing habits, and lack of knowledge of up-to-date, evidence-based guidelines may be contributing factors.

While there is a gap between evidence-based national guidelines and clinical practice to controlling HTN, patient barriers also need to be factored in and explored if successful interventions are to be developed. Compliance with office visit follow-up, medication compliance, coexisting conditions and patient beliefs are all patient-centered barriers. Patient medical compliance to medication regimens and lifestyle modification recommendations are key factors if provider recommendations are going to positively impact patient outcomes. Given the fact that uncontrolled HTN is due to multifactorial etiologies, future studies should incorporate patient-centered barriers.

One final provider implication is to use this data to implement strategies to improve quality of care. The EMR not only contributes to continuity of care but it can also be used as a means of improving patient care and outcomes. One such example is the use of a template that would flag patient visits for HTN. The initial inquiry would identify the patient as African American or other. Subsequently, if the patient is African American, it would ask if the patient is on a TD or CCB. Unless these drug classes are contraindicated due to various reasons (drug allergies, drug interactions, etc.), the EMR would recommend adding one of these drugs and refer the provider to the guidelines via a hyperlink. This process could also be useful in other populations and in those with compelling indications such as DM.

Conclusions

In conclusion, provider adherence to JNC 7 recommendations regarding antihypertensive drug therapy choices for AA in monotherapy is poor and/or poorly documented. Conversely, providers have demonstrated a preference in prescribing ACEIs and ARBS in monotherapy. Better adherence in prescribing a TD or CCB is seen in prescribing patterns for patients on combination therapy. Providers are not adherent to the monthly follow–up recommendations required for medication adjustment or specialist referrals when BP is not at goal. Lack of lifestyle modification documentation, specifically the DASH diet and alcohol consumption, is consistent with nonadherence to the JNC 7 guidelines. Although there appears to be no relationship between receiving the recommended medications and BP outcomes, more than half the population did not meet BP goals.

Capstone Products

- Journal author submission guidelines.
- Draft manuscript for journal submission.

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Table 1. Background Studies

Studies	Purpose of the Study	Subjects and Setting	Design	Method	Outcomes
Background Studies					
Cook et al. (2006)	Explore provider perception to barriers of effective management of HTN and hyperlipidemia	251 providers' of various rankings	Pre-experimental, qualitative study	Survey	Teaching medical management ranked higher than teaching lifestyle changes (P<0. 001), few were confident they could change patient behavior (P< 0. 001)
Schoenthaler et al. (2009)	Evaluate patient perception of provider communication on medication adherence and the effect it has on the patient	439 patients, age 25 to 98 years, 68% female, 31% comorbidity of diabetes	Cross sectional study	Questionnaire and Morisky self-report measure	51% rated physician communication non-collaborative, collaborative communication increased medication adherence (β = -0.11, P =0 .03), age correlates with medication adherence (β = 0.13, p = 0.02)
Guideline Adherence					
Etuk, E., Isezuo, S., Chika, A., Akuche, J., Ali, M. (2008)	Determine physician adherence with guidelines, pattern of drug selection, and effects on blood pressure	145 AAs in Nigeria age 17-91 years, 53% female, 46% male.	Retrospective cross-sectional study	Review of existing data	Diuretic most frequently prescribed, prescribed as single agent 44.8%, as combination therapy 88.8%. Better BP

					control on CCB than diuretic as monotherapy. BP control rate was 30.5%
Harman et al. (2013)	Examine medication regimens and their effect on BP control	Exam I 2415 persons, 1667 women, 748 men with mean age of 60; Exam II 2577 persons	Cohort study	Review of existing data	JNC 7 treatment goal met 56% in exam I and 61% in exam II. BP below 140/90 66% in exam I and 70% in exam II
Peck et al. (2013)	Determine difference in BP response to ACEI between blacks and whites	13 clinical trials	Meta-analysis	A literature review	Blacks less reduction in systolic BP (95% CI 3.5-3.7) and diastolic BP (95% CI 2.2-3.5)
Peters, R., Benkert, R., Butler, K., Brunelle, N. (2007)	Measure provider adherence to JNC guidelines and assess effectiveness on BP control	128 AA patients between 18 and 80 years, 66 males, 66 females	Retrospective chart review	Review of existing data	Provider adherence 76%, significant BP goal attainment (r=0.23; P<0.05)
Guideline Nonadherence					
Gerber et al. (2013)	Assess diuretic prescribing patterns	658 AA patients age 21-80 years, 34% male, 65.8% female	Retrospective and qualitative study	Review of existing data and in-home interview	5.5% not on antihypertensive medication, 46% on diuretic; those on diuretics had higher mean diastolic BP (89.2%) and high systolic BP (57.6%)

Odigie-Okon, E., Zarich, S., Okon, E., Dufresne, A. (2010)	Assess practice patterns and BP control	416 AAs age 31-97 with HTN, age 31-97 years, 267 women, 154 with diabetes	Retrospective study	Review of existing data	50.9% were at BP goal, 59.9% taking at least 2 drugs, 46.6% on ACEI, 38.9% on CCB, 38.9% on diuretics, 32% on BB, 22.4% on ARB

AA: African American; BP: blood pressure; CCB: calcium channel blocker; ACEI: angiotensin-converting-enzyme inhibitor; ARB: angiotensin II receptor blocker; BB: beta blocker; JNC 7: the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure

Table 2. Audit Tool

Pt.	Compelling Indication of DM	Diuretic of CCB as Initial Drug	ACEI or ARB if DM	Two drug classes if Stage 2 HTN	Medication Adjustment if BP not at goal	**Lifestyle Modification	*Labs February to July	HTN specialist Referral		Provider		Comments
								Yes	No	MD/DO	NP	
1.												

*Labs: Glucose, GFR, Hematocrit, Lipids, Urine or microalbumin, and Hemoglobin A1C if diabetic.
**Lifestyle Modification: Dietary Approaches to Stop Hypertension (DASH), sodium, physical activity (PA), weight and alcohol.
NTN-Nutritionist; CARD-Cardiologist; MD-Medical Doctor; NP-Nurse Practitioner.

Appendices

Appendix A. RMG IRB Approval letter

RIVERSIDE
Internal Audit & Compliance

November 6, 2014

Ms. Jeanette Sessoms
Riverside Eastern Shore Physicians and Surgeons
9524 Hospital Avenue
Nassawadox, VA VA 23413

Dear Ms. Sessoms,

This is to inform you that the Riverside Health System Privacy Board has approved the following study: An Evaluation of Provider Pharmacological Adherence to National Guidelines for Hypertensive African Americans. The study was approved on October 31, 2014. This study has met criteria for exemption from full board IRB review, under 45 CFR 46.101(b), Category 2, from the Federal Regulations governing human research. The Riverside Health System Privacy Board provides a monthly activity report to the Riverside Health System Institutional Review Board. This approval was reported to the Riverside Health System IRB Meeting on November 5, 2014.

It is the policy of Riverside Health System that all human subject research which is exempt under this section will be conducted in accordance with the Belmont Report, and with Riverside Health System administrative procedures to ensure the claims of exemption. All research involving human subjects must be approved by the IRB or meet exemption criteria for administrative review by the Privacy Board.

Sincerely,

Lisa B. Salsberry, Chairman
Privacy Board

cc: Cynthia Benavidez, IRB Coordinator

Riverside Health System • 608 Denbigh Boulevard, Suite 500-B • Newport News, VA 23608-4442
(757) 369-9359 • www.riversideonline.com

Appendix B. University of Virginia Determination Letter

UNIVERSITY of VIRGINIA IRB-HSR **Institutional Review Board for Health Sciences Research**

DETERMINATION OF UVa AGENT FORM

INFORMATION ABOUT THIS FORM

- This form is to determine if UVa personnel are or are not considered to be working as an Agent* for UVa on this project.
- If it is determined that UVa personnel are considered to be working as an Agent* for UVa the study team will be required to submit an additional submission to the IRB-HSR, unless the project is determined to not involve human subject research. See Determination of Human Subject Research Form

**Agent- all individuals (including students) performing institutionally designated activities or exercising institutionally delegated authority or responsibility.*

Enter responses electronically. Email the completed form to IRBHSR@virginia.edu for pre-review.
An IRB staff member will reply with any changes to be made.

Name of Individual to be Working on Project:	Jeanette Sessoms
Email:	jms2cy@virginia.edu
Phone:	757-442-6600 or 757-710-4774
UVa Messenger Mail Box #	N/A
Project/Protocol Title if Known:	☐ Unknown or Title: An Evaluation of Provider Pharmacological Adherence to National Guidelines for Hypertensive African Americans
Explain your role in the project: (200 words or less)	I am a UVA student in the DNP program. I am conducting this research as a part of fulfilling my program requirements . I am the lead and only investigator.
Explain the reason for traveling to the outside institution.	I am a long distance student who lives and works outside of Charlottesville/UVA. The proposed research will be conducted where I work.

1. Answer the following questions:

☐Yes ☐No I was involved in the design of this research project.
☐Yes ☐No A UVa IRB has approved this research. IRB-HSR #
☐Yes ☐No Funding to conduct this research will come from UVa.
☐Yes ☐No The only reason I am traveling to this outside institution is to work on this research.
☐Yes ☐No Working on this research is required for my degree program.

2. I confirm that

☐Yes ☐No I am a student, employee and/or faculty member of the University of Virginia.
☐Yes ☐No My work on this project will be overseen by the Principal Investigator and the IRB at the outside institution. This includes completing any training in human subject research protection as required by the outside IRB.
☐Yes ☐No I will communicate with the IRB and the Contracts Office, to determine what approvals may be needed, prior to receiving any data from the outside institution.

OR

3. I confirm that :

☒Yes ☐No I designed this research.
☒Yes ☐No I am a student at UVa but am employed by another institution.
☒Yes ☐No All subjects will be enrolled at this outside institution.
☒Yes ☐No The research will be overseen by their IRB and, if applicable, their HIPAA Privacy Board. This includes completing any training in human subject research protections as required by the outside IRB.
☒Yes ☐No There is no funding for this study or if there is funding, it will be handled by the institution at which I am employed.
☒Yes ☐No I have notified the outside IRB that an UVa IRB will not be overseeing my work. ATTACH COPY OF OUTSIDE IRB APPROVAL.

FOR IRB-HSR OFFICE USE ONLY

☒ UVa personnel are not considered to be working as an Agent for UVa on this project.
No approvals from the UVa IRB-HSR are required.

☐ UVa personnel are considered to be working as an Agent for UVa on this project.
Submit a research application to the UVa IRB-HSR.

Signature of IRB Chair, Director or Designee — Date: 11/20/14

Appendix C. Smart Plan

RIVERSIDE

Riverside Eastern Shore Physicians and Surgeons
9524 Hospital Avenue PO Box 77 Nassawadox, VA 23413
Phone: (757)442-6600 Fax: (757)442-3839

Name:
DOB

mySmartPlan™

S	***Self monitoring*** Take your blood pressure three times a week at different times and record on your Blood Pressure log form. Weigh yourself weekly. Check your blood sugars every morning before eating and record in your log. Notify us if your sugars are frequently above 130.
M	***Medication***
A	***Activity/Diet*** Follow your DASH diet and exercise (for example, walk) 30 minutes every day. Follow your low-fat, calorie restricted diet and exercise (for example, walk) 30 minutes every day.
R	***Risk Reduction*** Lose weight, watch your salt intake, lower your cholesterol, and control your blood pressure to the targets below. Lose weight, control your sugar, lower your cholesterol, and control your blood pressure to the targets below.
T	***Targets*** Blood pressure below 140/90. LDL (bad cholesterol) below 130. Weight below 155. HgbA1C below 7%. Blood pressure below 130/80. LDL (bad cholesterol) below 100. Weight below 155.

Appendix D: Dash Diet

RIVERSIDE

Riverside Eastern Shore Physicians and Surgeons
9524 Hospital Avenue PO Box 77 Nassawadox, VA 23413
Phone: (757)442-6600 Fax: (757)442-3839

Name:
DOB: Age:
Page 1

The Vermont Academic Detailing Program: www.vtad.org

Lifestyle modifications to prevent and manage hypertension

Modification	Recommendation	Approximate SBP Reduction
Weight Reduction	Maintain normal body weight (body mass index 18.5-24.9 kg/m2)	5-20 mmHg/10kg
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and low- fat dairy products with a reduced content of saturated and total fat.	8-14mmHg
Dietary sodium reduction	Reduced dietary sodium intake to no more than 100mmol per day (2.4g sodium or 6 g sodium chloride)	2-8mmHg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes per day, most days of the week.)	4-9mmHg
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks (e.g., 24 oz beer, 10oz wine, or 3 oz 80 proof whiskey) per day in most men, and to no more than 1 drink per day in women and lighter weight persons.	2-4mmHg
Meditation	Transcendental Meditation twice daily most days of the week	5mmhg

Reference: Table 9. JNC VII & Anderson, Liu, Kryscio. AJ HTN 21:310-316.

Key points about the DASH diet
DASH = Dietary approaches to stop hypertension
- High fruit and vegetable intake ~8 servings of each
- Probably lower in fat that many patients' diets
- Benefit may be due to high magnesium and potassium
- Though whole grain foods encouraged, some may benefit from further reducing the glycemic load of the diet.

Evidence for DASH diet
459 patients with hypertension were randomized to control diet, a diet rich in fruits and vegetables, or a diet low in fat and rich in fruits and vegetables (DASH). The greatest reduction was in the DASH group. The systolic blood pressure dropped by 11.4mmHg and diastolic by 5.5 mmHg compared to the control group.

Where to obtain copies of the DASH diet:
National Heart Blood and Lung Institute Web Site
http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/

Appendix E: Capstone Products

Author Guidelines for Submission to International Journal of Hypertension

Submission
Manuscripts should be submitted by one of the authors of the manuscript through the online Manuscript Tracking System. Regardless of the source of the word-processing tool, only electronic PDF (.pdf) or Word (.doc,. docx, .rtf) files can be submitted through the MTS. There is no page limit. Only online submissions are accepted to facilitate rapid publication and minimize administrative costs. Submissions by anyone other than one of the authors will not be accepted. The submitting author takes responsibility for the paper during submission and peer review. If for some technical reason submission through the MTS is not possible, the author can contact ijhy@hindawi.com for support.

Terms of Submission
Papers must be submitted on the understanding that they have not been published elsewhere and are not currently under consideration by another journal published by Hindawi or any other publisher. The submitting author is responsible for ensuring that the article's publication has been approved by all the other coauthors. It is also the authors' responsibility to ensure that the articles emanating from a particular institution are submitted with the approval of the necessary institution. Only an acknowledgment from the editorial office officially establishes the date of receipt. Further correspondence and proofs will be sent to the author(s) before publication unless otherwise indicated. It is a condition of submission of a paper that the authors permit editing of the paper for readability. All enquiries concerning the publication of accepted papers should be addressed to ijhy@hindawi.com.

Peer Review
All manuscripts are subject to peer review and are expected to meet standards of academic excellence. Submissions will be considered by an editor and “if not rejected right away” by peer-reviewers, whose identities will remain anonymous to the authors.

Concurrent Submissions
In order to ensure sufficient diversity within the authorship of the journal, authors will be limited to having two manuscripts under review at any point in time. If an author already has two manuscripts under review in the journal, he or she will need to wait until the review process of at least one of these manuscripts is complete before submitting another manuscript for consideration. This policy does not apply to Editorials or other non-peer reviewed manuscript types.

Article Processing Charges
International Journal of Hypertension is an open access journal. Open access charges allow publishers to make the published material available for free to all interested online visitors. For more details about the article processing charges of International Journal of Hypertension, please visit the Article Processing Charges information page.

Units of Measurement

Units of measurement should be presented simply and concisely using System International (SI) units.

Title and Authorship Information
The following information should be included
- Paper title
- Full author names
- Full institutional mailing addresses
- Email addresses

Abstract
The manuscript should contain an abstract. The abstract should be self-contained and citation-free and should not exceed 200 words.

Introduction
This section should be succinct, with no subheadings.

Materials and Methods
This part should contain sufficient detail so that all procedures can be repeated. It can be divided into subsections if several methods are described.

Results and Discussion
This section may each be divided by subheadings or may be combined.

Conclusions
This should clearly explain the main conclusions of the work highlighting its importance and relevance.

Acknowledgments
All acknowledgments (if any) should be included at the very end of the paper before the references and may include supporting grants, presentations, and so forth.

References
Authors are responsible for ensuring that the information in each reference is complete and accurate. All references must be numbered consecutively and citations of references in text should be identified using numbers in square brackets (e.g., “as discussed by Smith [9]”; “as discussed elsewhere [9, 10]”). All references should be cited within the text; otherwise, these references will be automatically removed.

Preparation of Figures
Upon submission of an article, authors are supposed to include all figures and tables in the PDF file of the manuscript. Figures and tables should not be submitted in separate files. If the article is accepted, authors will be asked to provide the source files of the figures. Each figure should be supplied in a separate electronic file. All figures should be cited in the paper in a consecutive order. Figures should be supplied in either vector art formats (Illustrator, EPS, WMF, FreeHand, CorelDraw, PowerPoint, Excel, etc.) or bitmap formats (Photoshop, TIFF, GIF, JPEG, etc.).

Bitmap images should be of 300 dpi resolution at least unless the resolution is intentionally set to a lower level for scientific reasons. If a bitmap image has labels, the image and labels should be embedded in separate layers.

Preparation of Tables
Tables should be cited consecutively in the text. Every table must have a descriptive title and if numerical measurements are given, the units should be included in the column heading. Vertical rules should not be used.

Proofs
Corrected proofs must be returned to the publisher within 2-3 days of receipt. The publisher will do everything possible to ensure prompt publication. It will therefore be appreciated if the manuscripts and figures conform from the outset to the style of the journal.

Copyright

Disclosure Policy
A competing interest exists when professional judgment concerning the validity of research is influenced by a secondary interest, such as financial gain. We require that our authors reveal any possible conflict of interests in their submitted manuscripts.
If there is no conflict of interests, authors should state that “The author(s) declare(s) that there is no conflict of interests regarding the publication of this paper.”

Clinical Study
When publishing clinical studies, Hindawi aims to comply with the recommendations of the International Committee of Medical Journal Editors (ICMJE) on trials registration. Therefore, authors are requested to register the clinical trial presented in the manuscript in a public trials registry and include the trial registration number at the end of the abstract. Trials initiated after July 1, 2005 must be registered prospectively before patient recruitment has begun. For trials initiated before July 1, 2005, the trial must be registered before submission.

Ethical Guidelines
In any studies that involve experiments on human or animal subjects, the following ethical guidelines must be observed. For any human experiments, all work must be conducted in accordance with the Declaration of Helsinki (1964). Papers describing experimental work on

human subjects who carry a risk of harm must include a statement that the experiment was conducted with the understanding and the consent of the human subject, as well as a statement that the responsible Ethical Committee has approved the experiments. In the case of any animal experiments, the authors should provide a full description of any anesthetic and surgical procedure used, as well as evidence that all possible steps were taken to avoid animal suffering at each stage of the experiment.

Manuscript for Journal Submission: International Journal of Hypertension

Title and Authorship Information

Provider Adherence to National Guidelines for Managing Hypertension in African Americans

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Abstract

Purpose. To evaluate provider adherence to the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) guidelines for the treatment of hypertension in African Americans.

Design. A descriptive, pre-experimental, quantitative method.

Methods. Electronic medical records were reviewed and data were obtained from 62 charts. Clinical data collected included blood pressure readings, medications prescribed, laboratory studies, lifestyle modification, referral to hypertension specialist and follow-up care.

Findings. Overall provider adherence was 75%. Weight loss, sodium restriction and physical activity recommendations were documented on 82.3% of patients. DASH diet and alcohol consumption was documented in 6.5% of participants. Follow-up was documented in 96.6% of the patients with controlled blood pressure and 9.1% in patients with uncontrolled blood pressure. Adherence in prescribing ACEIs in patients with a comorbidity of DM was documented in 70% of participants. Microalbumin levels were ordered in 15.2% of participants. Laboratory adherence prior to prescribing medications was documented in 0% of the patients and biannual routine labs in 65% of participants.

Conclusion. Provider adherence overall was poor (75%). Provider adherence and blood pressure outcomes were not related. Findings may be due to multifactorial reasons that warrant further research.

Key words: provider adherence, antihypertensive therapy, African Americans.

Provider Adherence to National Guidelines for Managing Hypertension in African Americans

Hypertension (HTN) is a medical condition that is characterized by high or uncontrolled blood pressure. Inadequate control of HTN can lead to more serious vascular conditions affecting the major blood vessels in the heart, brain and body. Additionally, HTN and diabetes mellitus (DM) frequently coexist, which further increases the risk of developing vascular complications. Vascular complications are a group of disorders that affects the heart and blood vessels. Hypertension is a major risk factor for vascular disease including heart attacks and strokes [2]. In 2008, an estimated 17.3 million people died from vascular complications. Of those 17.3 million vascular-associated deaths, 6.2 million were due to strokes [16]. It is predicted that by the year 2030, an estimated 23.3 million will die from stroke and heart disease [16]. Addressing risk factors that contribute to HTN may help prevent vascular complications. According to the World Health Organization (WHO) [16], complications of HTN such as strokes account for 9.4 million of the astounding 17 million vascular-associated deaths. Another consideration is the financial burden of HTN; according to the Centers for Disease Control and Prevention (CDC) [4], the annual cost of HTN treatment was 131 billion dollars.

The physical and financial burdens of HTN are not unique to any one group of individuals. However, it has been well documented that African Americans (AAs) have a disproportionate burden of morbidity and mortality compared to Caucasians [2]. Data collected from 2008 suggest that non-Hispanic blacks accounted for 31.7 % of the 59.4 million people with HTN, whereas non-Hispanic whites accounted for only 26.8 % [3]. Despite research and interventions to decrease both the physical and financial burdens of uncontrolled HTN, specifically in the AA population, HTN remains a national problem.

Numerous interventions have been documented to improve control of HTN in AAs. The

aims of such interventions have been to reduce the barriers to better control. Provider-centered barriers are the focus of this study and include limited patient-provider communication regarding lifestyle changes, lack of adherence to established guidelines for HTN management and resistance to change. In addition, systems barriers were assessed and include access to care, medication costs, and lack of health care coverage [8]. Racial disparities related to geographical areas in health care lead to disproportionate mortality and morbidity in rural areas.

Patients often seek medical attention for chronic conditions from their primary care providers. Geographic location of this population and clinic locations can influence patient outcomes [7]. Rurality adds to the burden of HTN in AAs. Health care disparities such as ethnicity, poverty and access to care are all associated with Rurality and contribute to the higher incidence of HTN in AAs. For example, barriers to health care in rural communities include transportation, lack of health insurance, and lack of health care facilities and providers, all of which contribute to limited access to health care. As a result, rural communities have a higher incidence of chronic diseases such as HTN [10] and have poorer outcomes [7].

As previously mentioned, a major problem for rural communities is access to health care. Improving access to health care for rural America is a priority. The National Rural Health Association [11] has developed a timeline for the Affordable Care Act, which is designed to address the issues pertaining to access to health care. Provisions on the timeline include workforce improvement, payment reimbursement, and requirement of the electronic health record requirements, to name a few. Student loan repayment programs for those working in rural or underserved areas and improving Medicare and Medicaid reimbursement in rural practices are some specific provisions that have been implemented to improve access to health care in rural communities [11].

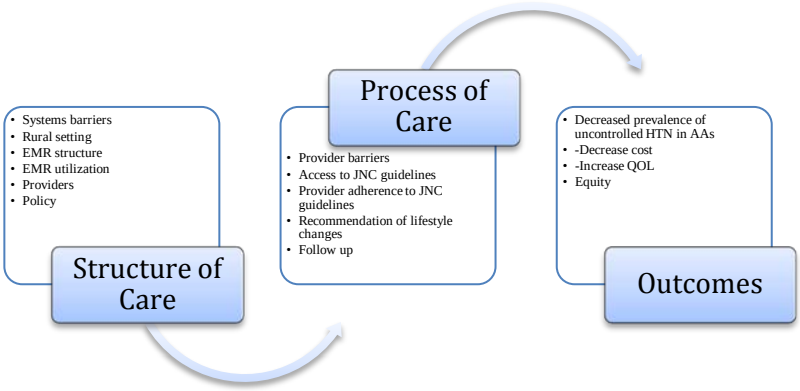
Methods

Theoretical Framework

The theoretical framework of Avedis Donabedian was used as a tool to guide this research. His framework was used to assess the quality of care provided in healthcare. The three components that form the foundation of this theory are 1) structure of care, 2) process of care, and 3) outcomes. The concept is grounded on the principle of healthcare outcomes as a result of the medical care provided by medical professionals [9].

Donabedian (as cited in McDonald et al., [9]) describes structure of care as any process that relates to the organizational and physical aspects of care settings. A few specific examples of this process are facilities, equipment, and operational and financial processes supporting medical care. The second component of this framework is process of care. Process of care is dependent upon the structures of care to supply resources and methods that are necessary for participants to carry out patient care activities. Patient-provider communication, practice habits and care management are all examples of process of care. Further, the goal of process of care is to improve patient health by promoting recovery, patient survival and even patient satisfaction [9]. The final concept of this model, outcomes, is simply the patient outcomes based on medical health after the application of the two previous components [9]. Figure 1 depicts the components of Donabedian's theory and how it is applicable to this study.

Figure 1. Application of Donabedian's Quality Care

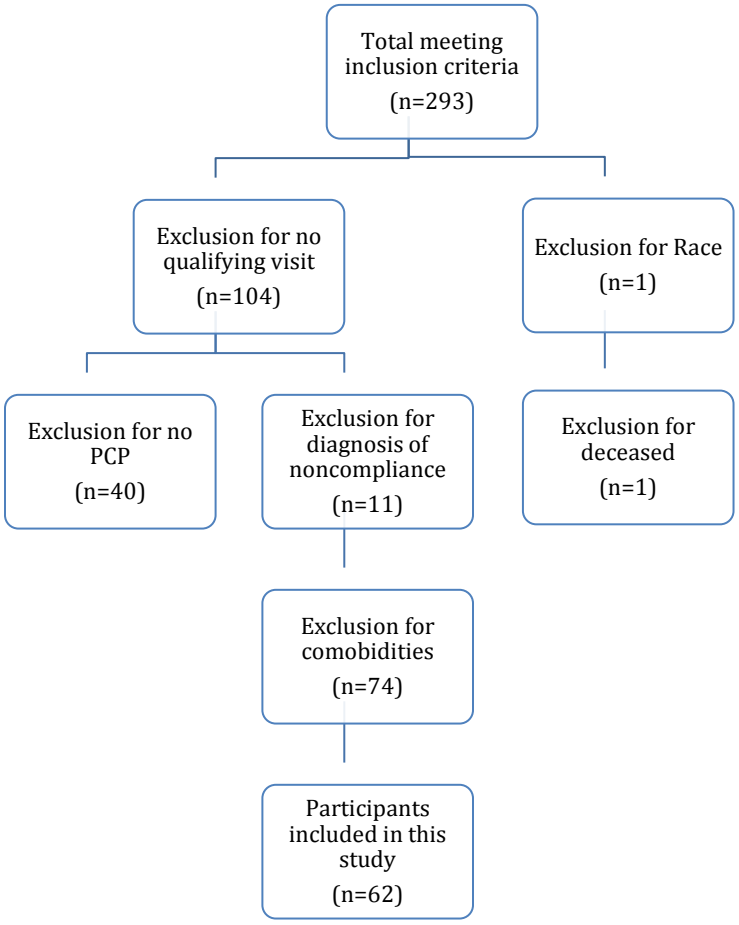


Study Design

A retrospective review of the EMR was conducted to identify hypertensive AA patients in a rural clinic who were seen from July 1, 2014 to August 31, 2014. A descriptive, pre-experimental, quantitative method was used to evaluate the degree of provider adherence to national HTN guidelines in AAs living in a rural community. Inclusion criteria for the patients included (Figure 2) a) age 20 to 80 years, b) AAs with a diagnosis of HTN, c) receiving antihypertensive medications. Exclusion criteria included a) specific end organ damage (i.e., CKD, stroke, cardiomyopathy or myocardial infarctions), b) age younger than 20 or greater than 80 years old, c) no office visits during research dates or office visits for reasons other than HTN, d) no established relationship with a single primary care provider (PCP), e) diagnosis of medical nonadherence, f) race other than AA, and g) deceased patients.

A sample of 62 participants met the inclusion criteria.

Figure 2. Participant Selection Algorithm



Study Setting and Sample

The study was conducted at a multi-physician practice located in a rural community. The practice serves the Eastern Shore of Virginia with a population of 45,273, 63.8% of which are AAs [13]. The practice accepts Medicare, Medicaid, private insurances and the indigent. The practice serves pediatric to geriatric patients. There are four primary care providers, one cardiologist, two pulmonologist, one neurologist and one podiatrist. Primary care providers were the focus of this study. The study aims to assess health care provider adherence to JNC hypertensive guidelines in AAs.

Data Collection and Procedures

The primary source data were selected from the EMR Centricity developed by General Electric Healthcare. An EMR is a digital or electronic version of a paper chart that contains the patient's medical history. The EMR was reviewed to identify onset of HTN if feasible, provider selection of anti-hypertensive drugs for initial treatment and additional drug choices. HTN was defined as a blood pressure >140/90 mmHg in the general population and >130/80 mmHg in hypertensive individuals with a comorbidity of DM in accordance with JNC 7. Patients who met the inclusion criteria were selected by convenience sample. A list of those patients was composed and each was assigned a research identifier. A sample size of 62 participants met the inclusion criteria. Demographic variables assessed included age, gender, marital status, and insurance coverage. Other variables that were considered include the following antihypertensive drug classes; a) thiazide diuretics, b) angiotensin-converting-enzyme inhibitors (ACEIs), c) angiotensin II receptor blockers (ARBs), and d) calcium channel blockers (CCBs). Evaluation of monotherapy and combination therapy was also performed.

Measures

JNC 7 (as cited in Chobanian et al., [5]) describes HTN as a systolic blood pressure > 140 mmHg or a diastolic blood pressure of > 90 mmHg in the general population, including AAs. If the patient has a comorbidity such as DM, a systolic blood pressure > 130 mmHg and a diastolic blood pressure of > 80 mmHg is considered suboptimal in the treatment of HTN. The coexistence of HTN and DM further increases the risk of vascular complications such as strokes, and renal disease, which is why the optimal blood pressure goal is lower [5].

Diagnostic measurements for the classification of HTN were performed based on JNC 7 guidelines (Table 3). According to JNC 7, two consecutive readings in contralateral arms at least

5 minutes apart while sitting are categorized as HTN. JNC 7 describes the stages of HTN. A normal blood pressure is a systolic blood pressure of <140 mmHg and a diastolic of <90 mmHg. Stage 1 is a systolic blood pressure reading of 140 to 159 mmHg or a diastolic BP reading of 90 to 99 mm Hg. Stage 2 is classified as a systolic blood pressure ≥160 mm Hg and a diastolic reading of ≥100 mmHg. In the general AA population, initial monotherapy with diuretics, specifically TDs or CCBs should be used for stage 1 HTN or a diuretic in combination with other drug classes for combination drug therapy regimen for stage 2 HTN. JNC 7 recommends specialty referrals if blood pressure is not controlled after maximizing three medication classes, with one being a TD. Lastly, those with compelling indications, such as those with a comorbidity of DM, ACEIs are recommended to reduce strokes and other vascular complications [5].

Table 3. Joint National Committee Classification of Blood Pressure for Adults

Blood Pressure Classification	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Normal	<120	and <80
Prehypertension	120-139	or 80-89
Hypertension	≥140	≥90
Stage 1 hypertension	140-159	or 90-99
Stage 2 hypertension	≥160	or ≥100

In regards to follow-up, JNC 7 recommends a monthly follow-up office visit if blood pressure is not at goal and every 3 to 6 months if BP is at goal. Laboratory values for potassium and creatinine should be obtained 1 to 2 times annually and patients with a comorbidity of DM should have their urine microalbumin levels measured at least annually. Patients newly

diagnosed with HTN should have a urinalysis, blood glucose, hematocrit, potassium, creatinine, calcium and lipid profile drawn prior to beginning pharmacological treatment.

JNC 7 recommends lifestyle modification education. Better outcomes have been found when lifestyle modification is incorporated into the plan of care. The following are the areas recommended for lifestyle modification: a) weight loss, b) following the Dietary Approaches to Stop Hypertension (DASH) diet, which consists of a diet rich in fruit and vegetables, low fat dairy products, and reduced intake of saturated and total fat, c) adhering to sodium restrictions, d) regular physical activity, and e) limiting alcohol consumption.

Data Analysis

Statistical analyses were performed on the outcomes of blood pressure control in participants who were prescribed antihypertensive medications based on JNC 7 guidelines compared to those who were not and also on blood pressures that were at goal and those that were not. Additionally, outcomes of provider adherence to the guidelines were measured based on adherence to medication choice recommendations, documented lifestyle modification recommendations, laboratory studies and follow-up for patients with HTN and HTN with a comorbidity of DM. Analysis has been conducted using standard statistical methods and reported as percentages to describe the results. Additionally, a chi square analysis was performed to determine if there is a relationship between provider adherence and blood pressure outcomes.

Results

The demographic characteristics of the 62 participants are described in Table 4. Of the 62 patients studied, 41.9% were male and 58.1% were female. Patient age was divided into 2 categories; less than 65 years and 65 and older. There were 50% patients in each age group. The mean age was 62.8 years. The most frequent stage of uncontrolled HTN was stage 1 accounting

for 84.4% of the 32 patients. Stage 2 HTN was detected in 15.6% of the patients. There were 16 nondiabetic patients who's BP was not at goal. Of those 16, 81% had stage 1 HTN and the remaining 19% had stage 2 HTN. In patient's aged less than 65 years, 45.2% of the 31 patients had Stage 1 HTN and 12.9% had stage 2 HTN. In the age group of 65 and over, stage 1 accounted for 41.9% of patients and stage 2 HTN accounted for 3.2%. Medicare coverage accounted for 56.5% of the study participants. Blue Cross Blue Shield (BCBS) accounted for the second most utilized health insurance with 24.2% of the patients enrolled. Medicaid, self-pay and private insurances each accounted for 6.5% of the patients.

Table 4. Demographics

Gender		
	Frequency	Percent
Male	26	41.9
Female	36	58.1
Total	62	100.0
Age		
	Frequency	Percent
<65 years	31	50.0
≥65	31	50.0
Total	62	100.0
Stages of Hypertension		
	Frequency	Percent
Stage 1	5	8.1
Stage 2	27	43.5
Controlled	30	48.4
Total	32	100.0
Marital Status		
	Frequency	Percent
Married	19	30.6
Divorced	6	9.7
Single	14	22.6
Widowed	8	12.9
Undetermined	15	24.2
Total	62	100.0

Insurance		
	Frequency	Percent
Medicare	35	56.5
Medicaid	4	6.5
BCBS	15	24.2
Self-pay	4	6.5
Private	4	6.5
Total	62	100.0

Pharmacologic Treatment

Drug therapy regimens are reported in Table 5. Of the 62 patients studied, 12.9% (n=8) were on monotherapy and 87.1% (n=54) were on combination therapy. Combination therapy is described as taking two or more medications. Those with a comorbidity of DM accounted for 53.2% (n=33) of the 62 patients. JNC 7 guidelines suggest patients with a comorbidity of DM should take ACEIs to decrease morbidity and mortality. Of the 33 diabetic patients, only 69.7% (n=23) were taking ACEIs as recommended. TDs or CCBs were not prescribed in any of the eight patients on monotherapy. Of the 54 patients taking combination therapy, 87% (n=47) were taking either a TD or CCB. In the patients studied, 53.2% (n=33) of the 62 warranted medication adjustments as a result of uncontrolled blood pressure. Only 15.2% (n=5) had medication adjustments, leaving 84.8% (n=28) inadequately treated. One patient (1.6%) required a referral to a HTN specialist as a result of maximizing three different medication classes, including a TD. That patient was not referred.

Table 5. Medication Regimen

Monotherapy with TD or CCB (n=8)		
On TD or CCB	Frequency (n)	Percent
Yes	0	0
No	8	100
Total	8	100.0
Combination Therapy with TD or CCB (n=54)		
Yes	47	87.0
No	7	13.0
Total	54	100.0
ACEI if comorbidity of DM (n=33)		
Yes	23	69.7
No	10	30.3
Total	33	100.0

Abbreviations: TD, thiazide diuretic; CCB, calcium channel blocker; ACEI, angiotensin converting enzyme inhibitor; DM, diabetes mellitus.

In the eight patients on monotherapy, 37.5% (n=3) of them met their blood pressure goal despite not being on a TD or CCB. Of the 54 patients on combination therapy, 87% (n=47) were on a TD or CCB as recommended by JNC 7. Of those 47 patients, 55.3% (n=26) achieved goal blood pressures. A chi square test was used to determine if there is a relationship between being prescribed JNC 7 medication regimen and blood pressure outcomes. There was no significant relation between taking the recommended TD or CCB and blood pressure control (X2=. 0; P=. 99).

Lifestyle Modifications

The categories examined under lifestyle modifications included DASH diet, weight loss, sodium restrictions, physical activity and alcohol consumption. Only 6.5% (n=4) of the 62 patients had documentation of provider recommendations for the DASH diet and alcohol consumption. The DASH diet includes recommendations for limiting alcohol consumption. Weight loss, sodium restriction and physical activity recommendations were documented in 82.3% (n=51) of the patients.

Follow-up Care

JNC 7 recommends follow-up every 3 to 6 months if BP is controlled. Providers were adherent with follow up recommendations 96.6% (n=28) of the time in the 29 patients with controlled blood pressure. In the remaining 33 patients who required monthly follow-up due to uncontrolled blood pressure, providers were only 9.1% (n=3) adherent to the recommendations.

Laboratory Recommendations

Providers were adherent to obtaining laboratory tests prior to initiating treatment in 0% of the two patients with new diagnoses of HTN. The adherence rate for biannual laboratory tests in patients with historical diagnosis of HTN was 65% (n=39) of the 60 qualifying patients. In patients with a comorbidity of DM, JNC 7 recommends annual urine micro albumin levels. Providers were 15.2% (n=5) adherent to the guidelines in the 33 diabetic patients.

Providers

Physicians accounted for 64.5% (n=40) of the providers in this study. Nurse practitioners (NPs) accounted for 35.5% (n=22). Of the 29 patients with blood pressure at goal, a physician was the provider in 75.9% (n=22) of the office visits while NPs provided care in 24.1% (n=7) of the visits.

Discussion

Endless and organized activities that result in measurable improvement in healthcare services and targeted patient outcomes have been described as QI [15]. The way care is delivered is related to quality. The U.S Department of Health and Human Services [15] identified the 4 principles of quality improvement (QI) as 1) QI work as systems and processes, 2) focus on patients, 3) focus on being part of the team, and 4) focus on use of data. QI work as systems and processes refers to resources and activities that are carried out and are evaluated simultaneously to improve quality of care or outcomes [15]. This is modeled after Donabedian's framework for quality improvement. This study focused on the systems or structural components of systems barriers such as the rural setting the study was conducted in, EMR structure, EMR utilization, providers and policy. Activities assessed included provider barriers, access to JNC 7 guidelines, provider adherence to those guidelines, recommendation of lifestyle changes, laboratory assessment and follow-up.

Evaluation of the first 2 components is necessary to produce or improve patient outcomes. Outcome goals include decreasing the prevalence of uncontrolled HTN in AAs, decreasing cost associated with HTN, increasing quality of life, and equity. This study was conducted to assess what is currently being done in this rural primary care setting to address the increased prevalence and mortality of HTN in AAs. Using the methodical framework of Donabedian, both quantitative (frequencies) and qualitative (descriptive) were collected and analyzed to assess the current system and to identify areas for improvement. The practice guidelines of JNC 7 were used as performance measures for comparison.

The JNC conducts and analyzes evidence-based studies periodically. Subsequently, JNC formulates recommendations based on those findings. The National Heart Lung and Blood

Institute (NHLBI) traditionally have endorsed previous versions. Controversy surrounding the Eighth Report of the Joint National Committee (JNC 8) has led to NHLBI not endorsing JNC 8 [1]. Other federal organizations have also declined to endorse the new recommendations. The controversy surrounds the increased BP goal of <150/90 in patients age >60 and a goal of <140/90 for those age 18 to 60, including those having comorbidities of DM and CKD. JNC 8 guidelines were avoided for this study due to this controversy and its relatively new release.

There are several main findings of this study. First, the first line drug choice as monotherapy in the treatment of HTN in AAs should be TDs or CCBs, as recommended by JNC 7. While there were only eight patients receiving monotherapy, none of them were on TDs or CCBs, which indicates 100% nonadherence to the guidelines regarding monotherapy. In fact, the majority of the patients on monotherapy were on ACEIs, while the remaining were on ARBs. Albeit, studies have found ACEIs and ARBs are less effective in the AA population. In contrast, providers were more consistent with the guideline recommendations in AAs on combination drug therapy. Provider adherence was documented in 87% of the patients receiving combination therapy. Less than half of the 62 patients in this study have at goal BP readings at the level recommended by JNC 7. Medication adjustments were not made in 18% of the 33.2% that required adjustments. This could be a contributing factor to patients not meeting their BP goal. However, there was no correlation between BP control in those patients prescribed the recommended medications and those that were not. Additionally, provider adherence in prescribing ACEIs in patients with a comorbidity of DM was seen in 70% of the population. Studies have shown that the use of ACEIs in this population decreases mortality and morbidity by decreasing end organ damage and cardiovascular incidents.

Lifestyle modification, as an adjunct to pharmacologic therapy, has been associated with better BP control. Provider adherence to alcohol consumption and DASH diet recommendations were poorly documented. Detailed recommendations for the DASH diet and alcohol were only documented in 4 of the 62 EMRs. Adherence was high in the recommendations for physical activity, weight loss and sodium restrictions. The Smart plan is inclusive of these 3 recommendations, which was documented in 51 of the 62 patients.

Patient adherence with adequate office visit follow-up has been known to yield better BP control. JNC 7 recommends an office visit follow-up every 3 to 6 months in patients with BP at goal and monthly for those who are not at goal. Provider adherence was evident in the 3 to 6 month follow-up population (97%). A monthly follow-up recommendation for those with uncontrolled BP was poorly represented in this study.

Uncontrolled BP can lead to end organ damage such as renal insufficiency or failure, heart attacks or strokes. Further, the medications used to treat HTN can have adverse effects on other organs. JNC 7 recommendations include a urinalysis, blood glucose, hematocrit, potassium, creatinine, calcium and lipids in patients newly diagnosed with HTN before initiating therapy. Due to the limitations of the EMR, only 2 patients were identified as newly diagnosed. Of these patients, neither of them had laboratory testing performed prior to starting treatment. Diabetics should have a urine microalbumin level annually. Only 15% of diabetics had documented microalbumin levels within the preceding 6 months.

Conclusions

Despite evidence-based recommendations by JNC 7, provider adherence in AAs is poor. Provider pharmacologic choices and lifestyle modification recommendations are major components to blood pressure control in this population. Thiazide diuretics are recommended as

initial monotherapy and in combination therapy for African Americans. CCBs are recommended as an acceptable alternative to thiazide diuretics. CCBs are preferred over ACEIs because of the increased risk of stroke, myocardial infarctions and other vascular conditions associated with ACEIs. Conversely, providers have demonstrated a preference in prescribing ACEIs and ARBS in monotherapy. Better adherence in prescribing a TD or CCB is seen in prescribing patterns for patients on combination therapy. Providers are not adherent to the monthly follow–up recommendations required for medication adjustment or specialist referrals when BP is not at goal. Lack of lifestyle modification documentation, specifically the DASH diet and alcohol consumption, is consistent with nonadherence to the JNC 7 guidelines. Although there appears to be no relationship between receiving the recommended medications and BP outcomes, more than half the population did not meet BP goals.

The principal factor assessed in the process of care was provider barriers. Specific components impacting provider barriers include access to JNC 7 guidelines, provider adherence to JNC 7 guidelines, recommendation of lifestyle changes and follow up. Provider adherence to the guidelines overall was poor. Lack of documentation, provider-prescribing habits, and lack of knowledge of up-to-date, evidence-based guidelines may be contributing factors. While there is a gap between evidence-based national guidelines and clinical practice to controlling HTN, patient barriers also need to be factored in and explored if successful interventions are to be developed.

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