PROVIDER ADHERENCE TO THE JNC 8 GUIDELINES IN AN INTEGRATED PRIMARY CARE AND BEHAVIORAL HEALTH SETTING

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DNP Capstone Project Approval Form

This is to certify that Teresa Sion (Name of Student) successfully defended his/her Capstone project entitled:
Provider Adherence to the JNC 8 Guidelines in an Integrated Primary Care and Behavioral Health Setting

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Abstract

Problem: A significant number of individuals have uncontrolled hypertension despite receiving antihypertensive therapy. This has been attributed, in part, to the lack of provider adherence to the clinical guidelines.

Purpose: The objective of this project was to evaluate provider adherence to the Eighth Joint National Committee (JNC 8) guidelines for the management of hypertension in patients at a community primary care center co-located within a behavioral medicine practice.

Theory: Stokols’ (1992) Social Ecology Model for Health Promotion guided this project.

Methods: An exploratory retrospective chart review was conducted. Adherence rates were analyzed using descriptive statistics, Pearson’s chi-square tests, and independent t-tests.

Results: Provider adherence rate to the JNC 8 guidelines for intensification of therapy was 60.3%, with an 84.4% adherence rate to the guidelines for medication class. No significant difference was found between provider adherence rates between care groups.

Implications to Practice: Provider factors which contribute to clinical inertia in the treatment of hypertension in integrated care settings must be addressed to improve clinical outcomes. Further research which examines provider and patient factors that impede management of hypertension is necessary.
The mortality rate of individuals with serious mental illnesses (SMI), such as depression, bipolar disorder, and schizophrenia, is two to three times higher than that of the general population (De Hert et al., 2009). Similar to the general population, cardiovascular disease (CVD) is the leading cause of death among patients with SMI (Colton & Manderscheid, 2006; De Hert et al., 2009). Although mortality due to cardiovascular disease has decreased in recent decades in the general population, the same trend has not followed in patients with serious mental illnesses (Newcomer & Hennekens, 2007).

There are many factors which contribute to the increased cardiovascular mortality of patients with SMI. Patients with SMI are more likely to have hypertension, hyperlipidemia, diabetes, smoke, and be overweight than the general population (Newcomer & Hennekens, 2007). Individuals with SMI face many barriers to receiving primary care services including poverty, access to services, and an inability to navigate a complex healthcare system. Therefore, they have less access to cardiovascular risk screening and treatment (De Hert et al., 2009). Additionally, low treatment rates for diabetes, dyslipidemia, and hypertension have been reported in patients with schizophrenia, with up to 63% of patients with hypertension going untreated (Nasrallah et al., 2006). This is most likely due to patients with SMI experiencing increased levels of clinical inertia, or the failure of the provider to initiate or intensify treatment when it is clinically indicated (Mitchell, Lord, & Malone, 2012).

It has been recommended that mental health providers integrate and work closely with primary care providers to decrease the barriers to primary care and cardiovascular health disparities in patients with SMI and that patients with SMI are treated for their physical illness utilizing the same evidence-based guidelines used for the general population (De Hert et al., 2011). Best Self Behavioral Health, a behavioral health provider, has done this through
partnering with UBMD Family Medicine to provide co-located primary care to their patients. In 2016, the UBMD Family Medicine clinic within Best Self Behavioral Health implemented the Eighth Joint National Committee (JNC 8) evidence-based guidelines for the management of hypertension, as part of their United States Substance Abuse and Mental Health Services Administration (SAMHSA) Primary and Behavioral Health Care Integration (PBHCI) grant. As part of this funding, each grantee was required to choose an evidence-based guideline for hypertension to implement in their practice. Best Self Behavioral Health’s patient population consists of Assertive Community Treatment (ACT) patients and patients who qualify for New York State (NYS) Health Home.

Individuals who qualify for ACT team treatment include patients with serious mental illness and/or substance abuse which impedes their ability to utilize traditional behavioral health services (New York State Office of Mental Health, 2014). The NYS Health Home is a health care model designed to help meet the needs of individuals with Medicaid insurance who require a complex network of organizations (providers, health plans, and community organizations) to comprehensively meet their health care needs (New York State Department of Health, 2017). Many health home patients have psychiatric diagnoses and are followed by behavioral medicine but do not require the intensity and complexity of treatment provided by the ACT team.

It is necessary to evaluate the effectiveness of the implementation of the JNC 8 guidelines on this patient population to contribute to the evolving scientific knowledge on best practices for treating physical illnesses in patients with SMI and decrease the wide health disparities experienced by patients with serious mental illness.
Needs Assessment

At Best Self Behavioral Health, only twenty-nine percent of the patient population have a normal blood pressure, defined as a systolic blood pressure less than 120 mmHg and a diastolic blood pressure less than 80 mmHg. The rate of hypertension, defined as a systolic blood pressure greater than 140 mmHg or a diastolic blood pressure greater than 90 mmHg, in this patient population is thirty-two percent. There is some variance in blood pressure rates between this practice’s ACT and Health Home patients. Twenty-nine percent of Health Home patients were normotensive, compared to twenty-five percent of ACT patients. Health Home patients’ rate of hypertension was thirty-one percent, whereas the rate of hypertension in ACT patients was thirty-seven percent (Lake Shore Whole Person Health, 2017).

The patients at Best Self Behavioral Health also have high rates of many identified risk factors for cardiovascular disease, including hyperlipidemia, diabetes, smoking, and obesity (Newcomer & Hennekens, 2007). Thirty-two percent of patients in the practice have a total cholesterol greater than 200mg/dL and twenty-eight percent of patients’ triglyceride levels are greater than 150mg/dL. Fifty-one percent of patients are either diabetic or prediabetic, fifty-two percent of patients have an increased waist circumference, and fifty-nine percent of the patient population reported using tobacco products daily or almost daily (Lake Shore Whole Person Health, 2017).

Advanced Practice Nurse Role

As Advanced Practice Nurses (APNs), it is important that we deliver the most up-to-date, evidence-based care to our patients. Following the evidence-based guidelines in the literature is an important part of ensuring that we are providing optimal care for our patients. This project will provide valuable feedback to the health care providers at Best Self Behavioral Health.
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regarding if their practice is congruent with the JNC 8 guidelines and identify areas which may require improvements in guideline adherence, to enhance the health outcomes of their patient population.

This project will address Doctorate of Nursing Practice (DNP) Essential III (Clinical Scholarship and Analytical Methods for Evidence Based Practice) and DNP Essential VIII (Advanced Nursing Practice) (American Association of Colleges of Nursing, 2006).

Problem Statement

Individuals with serious mental illness experience many complex health disparities which contribute to their increased cardiovascular morbidity and mortality. Clinical inertia, in the treatment of hypertension, is a disparity patients with SMI experience, that if identified can be addressed by the provider to help optimize the patient’s cardiovascular health.

The purpose of this capstone project will be to evaluate provider adherence to the Eighth Joint National Committee (JNC 8) guidelines for the management of hypertension in patients at the UBMD Family Medicine clinic at Best Self Behavioral Health. This information will be utilized to promote increased adherence to the guidelines and optimize the management of hypertension for patients receiving care at the practice.

Project Questions

What is the rate of provider adherence to the Eighth Joint National Committee (JNC 8) guidelines for the management of hypertension in patients at the UBMD Family Medicine clinic at Best Self Behavioral Health?

When deviations from the guidelines are identified, did the provider document a rationale for the deviation (patient factors, provider preferences) in the patient’s chart? What are the most common reasons for deviation from the guidelines?
Is there a difference in provider adherence to the JNC 8 guidelines in the management of ACT team patients versus Health Home patients?

**Review of the Literature**

**Cardiovascular Disease in Patients with SMI**

In the United States, patients with SMI have a ten to thirty year decrease in life expectancy, as compared with the general population (Correll et al., 2014). This decrease in life expectancy has been attributed to premature deaths caused by cardiovascular disease (Newcomer & Hennekens, 2007). Mortality from cardiovascular disease in the general population of the United States has decreased from over 50% to 36% in the past several decades. Results from recent studies in the literature suggest that this decrease in mortality is due to improved diagnosis and treatment of cardiovascular disease, not due to primary prevention of CVD (Newcomer & Hennekens, 2007). The decrease in mortality from cardiovascular events experienced by the general population of the United States has not been similarly experienced in patients with serious mental illness. This is thought to be due to a wide variety of physical, behavioral, environmental, and societal factors (Correll et al., 2014; De Hert et al., 2011; De Hert et al., 2009; Newcomer & Hennekens, 2007).

Individuals with serious mental illness face financial, environmental, and health literacy barriers to obtaining care. Additionally, patients with SMI significant barriers to seeking and receiving health care for physical illnesses. These include, but are not limited to, decreased ability to identify physical signs and symptoms of disease and lack of problem solving skills necessary for disease management (De Hert et al., 2011).

Antidepressant and antipsychotic medications can induce metabolic syndrome, placing the individual at increased risk for cardiovascular disease (De Hert et al., 2009). Furthermore,
patients with SMI have increased rates of multiple co-morbid conditions, as compared to the general population, including hypertension, hyperlipidemia, diabetes, tobacco use, and obesity, all of which are risk factors for cardiovascular disease (Newcomer & Hennekens, 2007). Recent data has suggested that the increased rates of these co-morbid conditions is due to individuals with serious mental illnesses receiving inadequate care for their physical illnesses (Correll et al., 2014).

Many patients with serious mental illness only have contact with behavioral health providers and do not receive primary care services (De Hert et al., 2011; De Hert et al., 2009). Even when individuals with serious mental illness have access to primary care services, they often do not receive the recommended pharmacotherapy (Mitchell et al., 2012). Over 60% of cases of hypertension goes untreated in patients with schizophrenia and it is presumed that similar rates of untreated hypertension exist in all patients with SMI (De Hert et al., 2009; Nasrallah et al., 2006). It has been reported that patients with serious mental illness only receive a prescription for angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers (ACE/ ARBs) and beta-blockers equitable to what a member of the general population would receive 74% of the time (Mitchell et al., 2012). There is no scientific basis for this discrepancy as it is recommended that patients with SMI receive treatment for their physical illnesses utilizing the same guidelines as the general population (De Hert et al., 2009). This disparity in prescribing of medications is likely due, in part, to patients with SMI experiencing high rates of clinical (or therapeutic) inertia in treatment for physical illnesses (Mitchell et al., 2012).

**Clinical Inertia**

In the general population of the United States, it is estimated that over 30% of patients receiving antihypertensive therapy have a blood pressure greater than goal blood pressure
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recommended in the guidelines. This has been attributed to medication non-adherence and clinical inertia (Kronish et al., 2016). Clinical inertia in the management of hypertension is the lack of treatment initiation or intensification by the provider despite a blood pressure which is not at the goal set by the clinical guidelines (Kronish et al., 2016; Lebeau et al., 2014). Up to sixty-six percent of patients experience clinical inertia in the management of their hypertension (Harle, Harman, & Yang, 2013).

It is hypothesized that clinical inertia occurs for several different reasons. Organizational reasons, such as insufficient support staff, availability of follow up appointments, patient volume, and lack of training on the guidelines are frequently cited as causes of clinical inertia (Harle et al., 2013; Lebeau et al., 2014; Viera et al., 2010). Competing demands, prioritization of provider time, and medication related factors (number of prescribed medications, side effects) may cause providers to delay intensification of antihypertensive therapy in exchange for improved control of comorbidities they consider more critical. Overestimation of care, “soft reasons” (“improving control”, “close enough to goal”), and clinical uncertainty that the measured blood pressure accurately represents the patient’s true blood pressure status (white coat syndrome) have also been described as reasons for clinical inertia (Lebeau et al., 2014; Viera et al., 2010).

The two patient factors which have been strongly correlated with clinical inertia in the literature are increased age and obesity (Harle et al., 2013; Viera et al., 2010). Presence of multiple comorbidities, such as diabetes and chronic kidney disease (CKD), has been associated with increased clinical inertia in the literature, however, Harle et al. (2013) found that patients with a comorbidity had decreased odds of experiencing clinical inertia (Ardery et al., 2007; Viera et al., 2010). Harle et al. (2013) also reported that patients with Medicare or Medicaid insurance
have increased odds of experiencing clinical inertia in the management of their hypertension than patients with private insurance. Patient non-compliance with medications, low health literacy, and unwillingness to take additional medications have also been cited as reasons for clinical inertia (Lebeau et al., 2014).

**JNC 8 Guidelines**

In 2014, the Eighth Joint National Committee (JNC 8) released updated guidelines for the management of hypertension in adults (James et al., 2014). The JNC 8 guidelines differed most notably from the 2003 JNC 7 guidelines in that it stated that for patients less than 60 years of age a threshold blood pressure of 140/90 mmHg is recommended, even for patients with co-occurring diabetes and chronic kidney disease (CKD) (Chobanian et al., 2003; James et al., 2014). The JNC 8 stated that their reason for loosening the blood pressure threshold for patient with diabetes and CKD from 130/80 mmHg to 140/90 mmHg was that no significant benefits to health outcomes or mortality with tighter control have been found in the literature (James et al., 2014).

The JNC 8 guidelines state that in general non-black population a thiazide diuretic, ACE inhibitor, ARB, or calcium channel blocker (CCB) is prescribed as initial therapy. Initial treatment of hypertension in the general black population, even those with diabetes, should be done with a thiazide diuretic or a calcium channel blocker (CCB). ACE inhibitors or an ARB should be prescribed as initial or add on therapy in all patients with CKD, regardless of race or diabetes status (James et al., 2014).

The JNC8 guidelines are widely accepted as the standard of care for patients with hypertension and have been endorsed by the Institute for Clinical Systems Improvement (Kenning et al., 2014). It has been shown that the JNC 8 guidelines decreases the need for
The health disparity in morbidity and mortality due to cardiovascular disease in patients with serious mental illness has been attributed to failure to adequately manage co-morbid risk factors for CVD (obesity, smoking, diabetes, hypertension, and hyperlipidemia) in patients with SMI (De Hert et al., 2009). Whereas in the general population, improved secondary and tertiary prevention has significantly decreased mortality from CVD in recent decades, this trend has not followed in patients with SMI, leading to a widening health disparity both in the United States and globally (Correll et al., 2014; De Hert et al., 2009; Newcomer & Hennekens, 2007).

The prevention and treatment of cardiovascular disease in patients with serious mental illness is affected by multiple complex factors, including genetic, environmental, socioeconomic, behavioral, interpersonal, intrapersonal, and cultural factors. The complex interplay between these factors to produce the health outcomes for individuals with SMI can be understood through the lens of Stokols’ (1992) Social Ecology Model for Health Promotion.

The Social Ecology Model for Health Promotion was derived from systems theory and social ecology theory to contextualize health promotion through psychological, organizational, cultural, and policy perspectives emphasizing the dynamic relationship between the individual and their environment (Best et al., 2003). This framework states that there are four key concepts to individual and population health which must be considered when developing strategies for health promotion (Stokols, 1992).
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The first concept of the Social Ecology Model for Health Promotion is health behavior, which is influenced by physical environments (geography, technology, access to resources), social environments (culture, public policy, socioeconomic status), and personal attributes (genetics, behavior, psychological health) (Sallis, Owen, & Fisher, 2008; Stokols, 1992). Stokols’ (1992) second concept is human environments, which are complex and multidimensional in nature. Human environments are composed of many separate yet integrated physical and social components, perceived by individuals differently, creating a unique experience for each individual interacting in the environment, forming a complex social climate (Stokols, 1992). The third component is that human-environment reactions occur at various levels of the system, and each level has important implications to individual and population health (Stokols, 1992). These levels include individual, family, neighborhood, cultural groups, organizational, and population (Sallis et al., 2008; Stokols, 1992). Stokols’ (1992) fourth concept describes the cycle of mutual influence between individuals and their environment where individuals influence their environment, and that transformed environment then affects health behaviors (Sallis et al., 2008).

Discrepancies in provider adherence to treatment guidelines is one factor which contributes to the cardiovascular health disparities experienced by individuals with serious mental illness (Mitchell et al., 2012). Exploring the reasons behind decreased adherence to guidelines in this particular patient population is necessary to the development of solutions to address this problem. Provider adherence to the JNC8 guidelines can be analyzed through the lens of the Social Ecology Model for Health Promotion to explore the complex relationships between individuals and their environment, and how these relationships affect health behaviors.
and outcomes. It can also shed light upon areas in health care which can be redesigned to provide environments which promote positive health outcomes in individuals with serious mental illness.

**Methods**

**Setting**

This study was conducted at a UBMD Family Medicine clinic which is a co-located primary care practice within Best Self Behavioral Health, a behavioral health facility. UBMD Family Medicine is a multisite primary care practice affiliated with the University at Buffalo School of Medicine. The UBMD Family Medicine at Best Self site serves adult patients in an urban setting in Buffalo, New York. The population served by this practice has predominately low socioeconomic status and the majority of the patient population has at least one behavioral health diagnosis (Lake Shore Whole Person Health, n.d.). This practice accepts Medicare, Medicaid, and private insurances. The health care providers at this practice include a physician, nurse practitioners, and physician assistant.

**Study Design**

A descriptive, exploratory retrospective chart review design was utilized to evaluate provider adherence to the Eighth Joint National Committee (JNC 8) guidelines for the management of hypertension in patients at the UBMD Family Medicine clinic at Best Self Behavioral Health. Exploratory retrospective chart reviews have been used previously to evaluate physician adherence to hypertension guidelines and have produced findings externally validated by the literature (Ahmad et al., 2013; Andrade et al, 2004; Ardery et. al., 2007; Jami et al., 2007; Sessoms, Reid, Williams, & Hinton, 2015; Viera et al., 2010).
Variables

Hypertension was defined for the purposes of this study as a systolic blood pressure greater than or equal to 140 mmHg, 150 mmHg if sixty years of age or older, or a diastolic blood pressure greater than or equal to 90 mmHg from a properly taken blood pressure on at least two occasions, taken at least five minutes apart, in accordance with the JNC 8 guidelines (James et al., 2014). Non-adherence was operationalized as the failure of the provider to intensify antihypertensive therapy as recommended by the JNC 8 guidelines. In patients less than sixty years old, antihypertensive therapy should be initiated at a systolic blood pressure greater than or equal to 140 mmHg and/or diastolic blood pressure greater than or equal to 90 mmHg, and titrated to a goal systolic blood pressure less than 140 mmHg and diastolic less than 90 mmHg in accordance with the JNC 8 guidelines (James et al., 2014). In patients sixty years of age or older, antihypertensive therapy should be initiated at a systolic blood pressure greater than or equal to 150 mmHg and/or diastolic blood pressure greater than or equal to 90 mmHg, and titrated to a goal systolic blood pressure less than 150 mmHg and diastolic less than 90 mmHg in accordance with the JNC 8 guidelines (James et al., 2014). For this study, intensification of therapy was defined as either an increase in the dose of a previously prescribed antihypertensive medication or the addition of another antihypertensive medication to the patient’s medication regimen.

Whether the medication class prescribed was appropriate based on the JNC 8 guidelines was an additional variable assessed in this study. The JNC 8 guidelines state that in general non-black population a thiazide diuretic, ACE inhibitor, ARB, or CCB should be prescribed as initial therapy. A thiazide diuretic or CCB should be used in the initial treatment of hypertension in the general black population. Additionally, the JNC 8 guidelines state that ACE inhibitors or an
ARB should be prescribed as initial or add on therapy in all patients with CKD, regardless of race or diabetes status (James et al., 2014).

Number of cardiovascular risk factors was another variable assessed. Cardiovascular risk factors were defined in this study as comorbidity of diabetes mellitus, comorbidity of hypercholesterolemia, family history of coronary artery disease, elevated urine albumin (30mcg/mg creatinine or greater), obesity, and tobacco use. This variable was operationalized based on the peer-reviewed article by Milchak et al., (2006).

**Data Collection and Procedures**

Following study approval by the University at Buffalo Institutional Review Board (UBIRB) on October 3, 2017 (see Appendix A), a list of potential cases was identified using the UBMD Allscripts electronic medical record (EMR). The UBMD EMR was queried to populate a report containing patient names and dates of birth based on the following criteria: practice site location and an active International Classification of Diseases, Tenth revision (ICD-10) code of I10 (Primary hypertension), ICD-9 codes 401.0/401.1/401.9 (Hypertension), ICD-10 R03.0 (elevated blood pressure reading, without diagnosis of hypertension), or ICD-9 code 796.2 (elevated blood pressure reading, without diagnosis of hypertension).

**Cases**

A total of 155 patient charts were identified by the UBMD EMR query, these charts were manually reviewed to determine eligibility for inclusion based on inclusion and exclusion criteria. Inclusion criteria for the study was (a) documentation of diagnosis of either hypertension (ICD-10 code I10, ICD-9 codes 401.0/401.1/401.9) or prehypertension (ICD-10 R03.0, ICD-9 code 796.2) in medical records, (b) at least one office visit between February 1, 2016 and August 31, 2017, and (c) age greater than 18 years at time of office visit. Exclusion criteria included (a)
patients who do not meet inclusion criteria, (b) pregnancy during specified study period, (c) diagnosis of secondary hypertension (ICD-10 code involving I15, ICD-9 code involving 405) or hypertensive crisis (ICD-10 code involving I16), (d) patients receiving dialysis during study period, and (e) patients who were co-managed by a cardiologist.

Twenty-seven charts were excluded because the patient did not have any office visits during the study period. Ten charts were excluded because the patient was being co-managed by a cardiologist. Four charts were excluded because the patients’ blood pressure was <140/90 mmHg at each visit during the study period and they were not prescribed any antihypertensive medication, therefore did not meet the JNC 8 criteria for hypertension. Two charts were excluded because the patients refused blood pressure measurements at each office visit during the study period. Two patients were excluded because they were receiving dialysis during the study period. Two patients were excluded because their antihypertensive medications were not recorded in the chart, even though it was indicated that they were taking meds prescribed by their previous PCP.

A total of 108 patient charts met study criteria and were selected for manual chart review performed by the Principle Investigator. Selected cases were de-identified by randomly assigning a number from 1 to 108. All data collected from case charts were manually entered and stored by identification number in a Microsoft Excel spreadsheet (see Appendix B) on a password protected laptop which only the principle investigator had access to. The patient’s name and date of birth were linked to the study identification number in a separate Excel spreadsheet on the password protected laptop.

Cases that met the inclusion criteria were reviewed for provider adherence to the JNC 8 guidelines for each individual office visit during the study period. Data was collected on a total of 466 office visits. For all office visits between February 1, 2016 and August 31, 2017 blood
pressure readings were assessed to determine if antihypertension therapy should have been either initiated or intensified based on the guidelines and recorded in the data collection sheet (see Appendix B). If the blood pressure was not at goal of less than 140/90 mmHg, several data points were assessed. The data collected included initiation or intensification of therapy, adherence to the JNC 8 guidelines for the antihypertensive drug class prescribed (thiazide diuretics, ACEIs, ARBs, calcium channel blockers) and number of medication classes prescribed. In cases of provider deviation from the guidelines, the clinical note was reviewed to see if the provider documented a rationale for deviation for the guidelines. Reason for deviation was then categorized (patient preference, choosing to watch and wait, patient non-adherence to medication, etc.).

Additional variables which were collected included cardiovascular risk factors, documentation of recommended goal blood pressure, documented lifestyle modification recommendations, EKG orders, laboratory tests, and follow-up spacing. These variables were used to quantify an overall provider adherence score based on an explicit criteria for adherence tool developed by Milchak et al., (2006) and modified to fit the JNC 8 guidelines (see Appendix C). Each criteria was scored as either met (1) or unmet (0). If the criteria was not applicable to the patient it was not be scored. Adherence was calculated as a percentage by dividing the total number of criteria met (scored as 1) by the total number of criteria applicable to the patient (1 or 0), therefore, criteria not applicable to the case was not be calculated into the adherence score. Overall adherence scores were calculated using this tool. Additionally, adherence scores for each subcategory of this tool (diagnosis, drug therapy, follow-up intensity, and laboratory monitoring) were calculated in order to more specifically identify areas which could be targeted for improvement of adherence.
Next, patients who met inclusion criteria were identified in the Statistical Package for the Social Sciences (SPSS) database “Lakeshore Whole Person Health Data Dashboard”. This database contains patient demographic characteristics and health outcome data reportable to the US Substance Abuse and Mental Health Services Administration (SAMHSA) as required for their Primary and Behavioral Health Care Integration (PBHCI) grant. Participants were identified in this database by name and date of birth. Variables assessed from this database included age, sex, race, care group, tobacco use, alcohol consumption, illicit drug use, homelessness, education level, employment status, waist circumference, hemoglobin A1c, total cholesterol level, triglyceride level, and carbon monoxide level. All data collected was de-identified and entered into the study data collection sheet (see Appendix B). The de-identified data was then transferred into a Statistical Package for the Social Sciences (SPSS) Version 24 database for analysis.

Ethical Considerations

This was a retrospective chart review, not human subjects’ research and there was no direct contact with the patients being studied or influences on the care they received. To protect patient confidentiality, all data used in this study was de-identified when it is taken from the patients’ charts and the “Lakeshore Whole Person Health Data Dashboard” database and entered into the Data Collection Excel spreadsheet, which was located on a password protected laptop which only the principle investigator had access to. The assigned patient identification number was linked to the patient’s name and date of birth in a separate Excel spreadsheet on a password protected laptop which only the principle investigator had access to. All chart review and data extraction from patients’ charts occurred on site at Best Self Behavioral Health to limit breach of data risk. All data collected from this study will be stored in the School of Nursing program
director’s office for three years. The Health Insurance Portability and Accountability Act (HIPAA) was followed throughout all phases of this capstone project.

**Data Analysis**

Statistical analysis was performed using SPSS software. Descriptive analysis was conducted using frequencies, percentages, crosstabs, and means comparisons. Pearson’s chi-square tests, which assumes the null hypothesis that the two variables being analyzed are not related, were used to determine if adherence rates were significantly associated with selected criteria. Independent t-tests were performed on aggregate adherence scores.

Analysis was also performed to compare the above outcomes between ACT team patients and Health Home patients. Frequencies, percentages, means comparison, and Pearson’s chi-square tests were used for this analysis. Additionally, adherence rates were analyzed using independent t-tests, which assumes the null hypothesis that the rates between the two groups will be equal. Level of significance for this study was set at $p < .05$.

**Results**

**Demographics**

This study analyzed 108 cases. Gender was male in 53 (49.1%) of the cases and female in 55 (50.9%) of cases. Patient age ranged from 19 to 79 years of age, with a mean age of 50.2 years of age. The majority of participants in this study self-identified as Black/African American (n=40, 37.0%) and White/Caucasian (n=34, 31.5%), 2.8% identified as multiracial (n=3), 2.8% American Indian (n=3), and 26% did not report their race (n=28). Participants self-identified as Hispanic/Latino in 27.8% (n=30) of cases. Of the cases reviewed, 68.5% (n=74) were for patients who are part of the NYS Health Home and 23.1% (n=25) were of patients on the ACT team, care group was not reported in 9 cases (8.3%) (see Table 1).
Adherence to JNC 8 Guidelines for Intensification

This study analyzed 466 unique office visits. Per the JNC 8 guidelines, intensification was required in 242 (51.9%) of the visits reviewed. Intensification was required by the guidelines and occurred in 13.1% of visits (n = 61). Intensification also occurred in 1.9% (n = 4) of visits even though it was not called for by the guidelines. Intensification was required by the guidelines but did not occur in 38.8% of visits (n = 181). In 47.2% of visits (n = 220) intensification was not required and did not occur (see Table 2).

The provider adhered to the guidelines, meaning intensified therapy for a blood pressure ≥140/90 mmHg (≥150/90 mmHg if sixty years of age or greater) or maintained current therapy for a blood pressure <140/90 mmHg (<150/90 mmHg if sixty years of age or greater) in 281 visits or 60.3% of the time (see Table 2). When intensification of therapy occurred, the dosage of the medication was increased 28.6% of the time, an additional antihypertensive was prescribed in 63.5% of visits, and the provider changed the class of antihypertensive the patient was prescribed in 7.9% of visits.

The provider documented a reason for not adhering to JNC 8’s guidelines for intensification of therapy in 101 visits. Of the documented reasons for non-adherence to JNC 8, the most common reason was patient non-adherence to medications (41.3% of time, n = 43), followed by the patient’s blood pressure was borderline (23.1%, n = 24), and the patient was out of their medications (20.2%, n = 21). Other documented reasons for non-adherence included patient request, trying lifestyle changes first, wanting tighter control of BP, the current antihypertensive therapy was initiated less than two weeks prior, wanting to check the patient’s TSH first, and orthostatic hypotension complaints.
Adherence based on SBP. A crosstabs analysis was performed to determine the frequency of adherence to JNC 8 recommendations for intensification of antihypertensive therapy based on the patient’s systolic blood pressure. The provider adhered to the guidelines 75.9% of the time (n = 211 visits) when the patients’ SBP was less than 140 mmHg, 33.3% (n = 25) for a SBP between 140-149 mmHg, 44.4% (n = 20) for a SBP between 150-159 mmHg, 50.0% (n = 20) for a SBP between 160-179 mmHg, and 32.1% (n = 9) when the patients’ SBP was 180 mmHg or greater (see Table 3). A Pearson Chi-Square test was used to determine if there was a statistically significant association between adherence to JNC 8 guidelines for intensification and systolic blood pressure. An association between adherence to JNC 8 guidelines for intensification of antihypertensive therapy and the patients’ systolic blood pressure was found ($\chi^2 = 67.186, p<0.05$) (see Table 4).

Adherence based on DBP. A crosstabs analysis was performed to examine the frequency of adherence to JNC 8 recommendations for intensification of antihypertensive therapy based on the patient’s diastolic blood pressure. The provider adhered to the guidelines 86.4% of the time (n = 236 visits) when the patients’ DBP was less than 90 mmHg, 10.6% (n = 12) for a DBP between 90-99 mmHg, 51.0% (n = 25) for a DBP between 100-109 mmHg, and 38.7% (n = 12) when the patients’ DBP was 100 mmHg or greater (see Table 3). A Pearson Chi-Square test was used to determine if there was an association between adherence to JNC 8 guidelines for intensification and diastolic blood pressure. An association between adherence to JNC 8 guidelines for intensification of antihypertensive therapy and the patients’ diastolic blood pressure was found ($\chi^2 = 203.692, p<0.05$) (see Table 4).

Adherence and comorbidity of diabetes mellitus. A crosstabs analysis was performed to determine the frequency of adherence to JNC 8 recommendations for intensification of
antihypertensive therapy based on if they had a comorbidity of diabetes mellitus. The patient had a comorbidity of diabetes mellitus in 138 visits (29.6%). The provider adhered to the JNC 8 guidelines for intensification of therapy in 63% of visits (n = 87) in which the patient was diagnosed with diabetes mellitus. The provider adhered to the guidelines in 60.4% of cases (n = 198) in which the patient did not have a diagnosis of diabetes mellitus (see Table 3). A Pearson Chi-Square test was used to determine if there was an association between adherence to JNC 8 guidelines for intensification of antihypertensive therapy and a comorbidity of diabetes mellitus. No significant association was found ($\chi^2 = 0.293, p = 0.588$) (see Table 4).

**Adherence between care groups.** A crosstabs analysis was performed to determine provider adherence rates to the JNC 8 guidelines for intensification of therapy based on whether the patient was part of the ACT team or NYS Health Home. Data on whether the patient was part of the ACT team or Health Home was available for 445 visits. For patients who were part of the ACT team, providers adhered to the JNC 8 guidelines for intensification of therapy 55.2% of the time (n = 48). The guidelines regarding intensification of therapy were adhered to 62.3% of the time for patients who were part of the Health Home (n = 223) (see Table 3). A Pearson Chi-Square test was used to determine if there was an association between care group and adherence of the guidelines for intensification of therapy. The result showed no significant association between care groups and adherence to the guidelines ($\chi^2 = 1.489, p = 0.222$) (see Table 4).

A crosstabs analysis was utilized to determine the frequency of reasons for provider non-adherence to JNC 8 in terms of intensification of therapy based on whether the patient was part of the ACT team or NYS Health Home. The provider documented a reason for non-adherence in eighteen visits of ACT team patients. Of the documented reasons for non-adherence to JNC 8, the most common reason for patients on the ACT team was patient non-adherence to medications
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(61.1% of the time, n = 11), followed by patient request (22.2%, n = 4). Additional documented reasons included the patient was out of their medications and current antihypertensive therapy was initiated less than two weeks prior.

The provider documented a reason for non-adherence to the JNC8 guidelines for intensification of antihypertensive therapy in 78 visits of Health Home patients. The most common documented reason was patient non-adherence to medications (37.0% of the time, n = 30), followed by borderline blood pressure (28.4%, n = 23), and the patient was out of their medications (21.0%, n = 17). Other documented reasons for non-adherence to the guidelines were trying lifestyle changes first, wanting tighter control of BP, patient request, current antihypertensive therapy was initiated less than two weeks prior, check TSH first, and orthostatic hypotension complaints.

Adherence to JNC 8 Guidelines for Medication Class Prescribed

Classes of medications prescribed. Of the 466 visits reviewed, the patient was prescribed only a thiazide diuretic 7.3% of the time, only an ACE Inhibitor in 11.6% of visits, only an ARB in 5.6% of visits, only a calcium channel blocker in 6.4% of visits, single therapy from another medication class 5.4% of the time, two medication classes in 30.3% of visits, three medication classes in 14.6% of visits, greater than three medication classes in 4.1% of visits, and were not prescribed any antihypertensive medications in 14.8% of visits (percentages were rounded to the nearest tenth causing the total percent to be 100.1%). The class of antihypertensive medication the patient was prescribed was appropriate based on the JNC 8 guidelines in 84.4% of visits (see Table 5).

The provider documented a reason for prescribing an antihypertensive medication class which was not recommended by the JNC 8 guidelines in 43 visits. The most common reason
documented was the patient was prescribed the medication by their previous primary care provider in 67.4% of visits. Other documented reasons included the medication class was chosen as therapy for a comorbidity, the patient was prescribed the medication upon discharge from the hospital, and due to adverse effects of the JNC 8 recommended medication classes (see Table 6).

Adherence to pharmacotherapy guidelines and race. A crosstabs analysis was utilized to determine the frequency of adherence to the JNC 8 guidelines for prescribing antihypertensive medication classes based on race. For African American patients, the rate of adherence to the JNC 8 guidelines for class of antihypertensive medication prescribed was 83.2% (129 cases). For patients of all other races, the rate of adherence to the JNC 8 guidelines for medication class was 86.7% (189 cases) (see Table 5). A Pearson Chi-Square test was used to determine if there was an association between adherence to the JNC 8 guidelines for medication class and race. No significant association between race and adherence to pharmacotherapy guidelines was found ($\chi^2 = 0.868, p = 0.351$) (see Table 7).

SBP and number of medication classes prescribed. A crosstabs analysis was run to determine the frequency that patients were prescribed two or more medication classes based on systolic blood pressure. For patients with a systolic blood pressure between 160-179 mmHg, two or more medication classes were prescribed in 77.5% of the time. For patients with a blood pressure greater than or equal to 180 mmHg, two or more medication classes were prescribed 78.6% of the time. A Pearson Chi-Square test was used to determine if there was an association between systolic blood pressure and number of medication classes prescribed. A statistically significant association between systolic blood pressure category and number of medication classes prescribed was found ($\chi^2 = 34.958, p<0.05$) (see Table 7).
Explicit Criteria for Adherence Tool

The explicit criteria for adherence tool (see Appendix C) was scored with a minimum score of 0 and maximum possible score of 1, with a score of 0 reflecting 0% adherence and a score of 1 reflecting 100% adherence to the guidelines for both the overall scores and the scores for the subcategories of the tool. Descriptive statistics were run for the explicit criteria for adherence tool overall scores (M = 0.71, SD = 0.148), the subcategory of drug therapy (M = 0.878, SD = 0.328), and the subcategory of follow-up (M = 0.589, SD = 0.394) (see Table 8).

Explicit criteria for adherence tool scores and care group. Descriptive statistics were run for the explicit criteria for adherence tool overall scores and the subcategories of drug therapy and follow-up based on whether the patient was part of the ACT team or Health Home. Descriptive statistics for patients on the ACT team included overall adherence tool score (M = 0.7, SD = 0.138), mean drug therapy criteria score (M = 0.783, SD = 0.415), and mean follow-up criteria score (M = 0.592, SD = 0.39). Descriptive statistics for Health Home patients included overall adherence score (M = 0.713, SD = 0.148), drug therapy criteria score (M = 0.894, SD = 0.308), and follow-up criteria score (M = 0.595, SD = 0.391) (see Table 8).

An independent t-test was used to determine if there was a significant difference between the mean overall, drug therapy criteria, and follow-up criteria adherence scores of the ACT team compared to the Health Home patients. No significant difference was found between the mean overall adherence scores of the two care groups (t = -7.36, df = 443, p = 0.462). A significant difference between the mean drug therapy criteria scores of ACT team and Health Home patients was found (t = -0.77, df = 85.261, p < 0.05). No significant difference was found between the mean follow-up criteria adherence scores of the ACT team and Health Home patients (t = -0.067, df = 433, p = 0.947) (see Table 9).
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Cardiovascular Disease Risk Factors

In this study, the patient had an additional cardiovascular disease (CVD) risk factor, apart from hypertension, in 95.9% of visits. A crosstabs analysis was utilized to compare the frequency that a patient had an additional CVD risk factor, apart from hypertension, between care groups. Patients who were part of the ACT team had an additional CVD risk factor in 100% of visits (n = 87). Health Home patients had an additional CVD risk factor in 94.7% of visits (n = 339) (see Table 10).

Number of CVD risk factors. Descriptive statistics were run for the number of CVD risk factors (including hypertension) that the patients had. Patients in this study had a minimum of one CVD risk factors and a maximum of six risk factors (M = 3.38, SD = 1.167) (see Table 11). In 4.9% of visits the patient had one CVD risk factor, two risk factors in 17.4% of visits, three risk factors in 32.2% of visits, four risk factors in 30% of visits, five risk factors in 11.2% of visits, and six risk factors in 4.3% of visits (see Table 10).

Number of CVD risk factors and care group. A crosstabs analysis was run to determine the frequency of number of CVD risk factors based on care group. For patients who were on the ACT team, in 14.9% of visits the patient had two CVD risk factors, in 51.7% of visits had three risk factors, in 31% of visits had four risk factors, and in 2.3% of visits the patient had five CVD risk factors. For patients who were part of the Health Home, patients had one CVD risk factor in 6.4%, two risk factors in 18.7% of visits, three risk factors in 24.9% of visits, four risk factors in 31.6% of visits, five risk factors in 12.8% of visits, and six CVD risk factors in 5.6% of visits (see Table 10). A Pearson Chi-Square test was used to determine if there was an association between care group and number of cardiovascular disease risk factors.
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(including hypertension). A statistically significant association between care group and number of CVD risk factors was found ($\chi^2 = 35.006$, $df = 5$, $p < 0.05$).

Descriptive statistics were run between the number of CVD risk factors ACT team patients had ($M = 3.21$, $SD = 0.718$) and number of risk factors Health Home patients had ($M = 3.42$, $SD = 1.265$) (see Table 11). An independent t-test was used to determine if the mean number of risk factors was significantly different between the ACT team and Health Home patients. There was a statistically significant difference found between the mean number of CVD risk factors in each care group ($t = -2.136$, $df = 233.014$, $p < 0.05$) (see Table 12).

**Number of CVD risk factors and adherence to JNC 8.** Descriptive statistics were run to analyze the number of CVD risk factors (including hypertension) and provider adherence to the JNC 8 guidelines for intensification of therapy. In visits that the provider adhered to the guidelines for intensification of therapy, the patients had CVD risk factors ($M = 3.36$, $SD = 1.134$). In visits that the provider did not adhere to the guidelines, the patients had CVD risk factors ($M = 3.39$, $SD = 1.19$). An independent t-test was used to determine if the mean number of risk factors was significantly different between cases which the provider adhered to the guidelines for intensification of therapy and visits in which the provider did not adhere to the guidelines. No significant difference was found ($t = -.305$, $df = 464$, $p = 0.761$) (see Table 12).

**Diagnostic Testing**

**EKGs.** In 22.1% of visits (103 visits) in this study, there was an EKG available in the patient’s chart (see Table 13).

**Laboratory tests.** Whether or not the recommended lab tests were ordered for the patient was identified in 420 of the 466 visits. In 74.5% of visits studied ($n = 313$), the patient had all of the recommended laboratory tests ordered. In 4 visits (0.01%) the patient refused blood draws.
Of the studied visits, a CBC was missing in 25 visits (6.0%), a CMP was missing in 25 visits (6.0%), a lipid panel was missing in 42 visits (10.0%), and a urine microalbumin was missing in 59 visits (14.0%) (see Table 13).

**Discussion**

Overall, patients in this study were at a goal blood pressure of less than 140/90 mmHg (less than 150/90 mmHg for sixty years of age or greater) in 48.1% of visits. This slightly higher than what has been previously documented in the literature which suggests that only approximately 45 to 47% of patients are at goal blood pressure (Harle et al., 2013; Jami et al., 2007; Sessoms et al., 2015; Viera et al., 2010).

Providers adhered to the JNC8 guidelines for intensification in 60.3% of visits in this study. This is markedly better than provider adherence rates published by Andrade et al. (2004) and Sessoms et al. (2015), who reported adherence rates of 16% and 15.2% respectively. However, the adherence rate of providers in this study is similar to rates reported by Ardery et al. (2007) (55.9%), Ahmad et al. (2013) (67.1%), and Theodorou et al. (2012) (70.4%). The large variance in reported adherence rates is likely due to studies that were conducted in multiple countries which utilized different hypertension guidelines. Additionally, many of the studies in the literature examined specific subpopulations, and therefore their results may not be generalizable to the entire population. Provider adherence rates in the all of these studies, including the present study, indicate a significant lack of adherence to guidelines for the management of hypertension.

The top three reasons for failure to intensify antihypertensive therapy when recommended by the guidelines documented by providers in this study were patient non-adherence to medications, borderline blood pressure, and patient out of their medications. Patient
non-adherence to medication and running out of their medications are patient factors which may be difficult for the provider to control, even with frequent education regarding the importance of blood pressure control and strategies for improving patient access to medications, for example using mail-order pharmacies to ship medications directly to the patient’s residence. However, failure of the provider to intensify therapy because they considered the patient’s blood pressure to be “borderline” is a provider factor which can be addressed. This “soft factor” contributed to 23.1% of non-adherence to the guidelines in this study. Provider satisfaction, with a blood pressure which they considered to be borderline but was per the guidelines above the threshold for treatment, was found by Andrade et al. (2004) to be the most common reason for provider non-adherence to antihypertension guidelines. Failure to treat a blood pressure because it is considered to be “borderline” has been frequently documented in the literature as a cause of therapeutic inertia in patients with hypertension (Harle et al., 2013; Lebeau et al., 2014; Theodorou et al., 2012; Viera et al., 2010). This is significant because up to sixty-six percent of patients with hypertension experience clinical inertia at least once in their course of treatment (Harle et al., 2013).

Chi-square analyses in the study showed an association between guideline adherence to both systolic blood pressure and diastolic blood pressure. However, this association is likely due to high adherence rates for SBP and DBP readings which did not require intensification. While other studies published in the literature found adherence rates improved with increasing SBP and DBP readings, this present study did not (Andrade et al., 2004; Viera et al., 2010). This study found provider adherence to only be 32.1% for SBP ≥ 180 mmHg and 38.7% for DBP ≥ 100 mmHg, which is fairly alarming. It is likely that the clinical inertia experienced by patients with such significantly high blood pressures in this study is due to two of the most commonly cited
reasons for non-adherence to the guidelines in this study: patient non-adherence to medications and the patient was out of their medications. In other words, the provider did not intensify therapy because the patient was not taking their prescribed medications in the first place.

It is also worth noting that adherence rates in this study were also low for patients with “borderline” blood pressures. This study found that providers adhered to the guidelines for intensification of therapy only one-third of the time when a patient’s SBP was between 140-149 mmHg and only one-tenth of the time when a patient’s DBP was between 90-100 mmHg. This correlates with both what has been previously documented in the literature and with this study’s second most common provider documented reason for failure to intensify therapy (Harle et al., 2013; Lebeau et al., 2014; Theodorou et al., 2012; Viera et al., 2010).

Previous studies in the literature produced conflicting results on the association between provider adherence to antihypertension guidelines and patient co-morbidity of diabetes mellitus. Ardery et al. (2007) and Harle et al. (2013) found that patients with a comorbidity of diabetes mellitus had decreased odds of experiencing clinical inertia in the treatment of their hypertension. However, both Ahmad et al. (2013) and Jami et al. (2007) reported that patients with a comorbidity of diabetes were less likely to experience blood pressure control. Andrade et al. (2004) and Viera et al. (2010) found that patients with diabetes mellitus were less likely to have their antihypertension therapy intensified when their blood pressures were not at goal. In this present study, no association was found between provider adherence to the JNC8 guidelines and comorbidity of diabetes mellitus, and adherence rates between patients with diabetes (63%) and without diabetes (60.4%) were very similar.

Although disparities in the treatment of hypertension in individuals with serious mental illness have been documented in the literature, this study did not find an association between
provider adherence to the guidelines and whether the patient was part of the ACT team (patients with serious mental illness) and patients who were part of the NYS Health Home (De Hert et al., 2009; Mitchell et al., 2012; Nasrallah et al., 2006). Provider adherence was approximately 7% less in ACT team patients than Health Home patients, however, this was not statistically significant. The most common reason for not intensifying antihypertensive therapy providers documented for both care groups was patient non-adherence to medications. Interestingly, although “borderline” blood pressure was the reason providers documented for failure to intensify therapy 23.1% of the time for the entire study population, it was not documented a single time on an ACT team patient, indicating that the providers at this practice may actually treat hypertension more aggressively in their patients with serious mental illness.

Patients in this study were prescribed antihypertension medications from classes deemed appropriate by the JNC 8 guidelines 84.4% of the time. This is markedly higher that previous studies have reported, in which medication class adherence rates ranged from as low as 36% to 67.1% (Ahmad et al., 2013; Jami et al., 2007). This study did not find an association between adherence to antihypertensive medication class and race, the adherence rate to medication class for African American patients in the study was 83.2%, compared with a rate of 86.7% in patients of all other races. These results differ from those published by Sessoms et al. (2015), who found 0% adherence to medication class guidelines in African American patients receiving monotherapy. However, Sessoms et al. (2015) reported an 87% medication class adherence rate in African American patients receiving combination therapy from more than one medication class which is similar to this present study’s results. The present study did not examine monotherapy verses combination therapy in relation to race.
Use of a single antihypertensive medication class is another documented reason in the literature for clinical inertia in the treatment of hypertension (Jami et al., 2007). It is recommended that providers prescribe antihypertension medications from two or more drug classes if the patient’s SBP is $\geq 160$ mmHg or DBP $\geq 100$ mmHg (James et al., 2014). An association between SBP and number of medication classes was found in this study, with 77.5% of patients with SBP between 160-179 mmHg prescribed antihypertensive therapy from at least two medication classes and 78.6% of patients with SBP $\geq 180$ mmHg prescribed two or more medication classes.

In this study, the explicit criteria for adherence tool (see Appendix C) modified from Milchak et al. (2006) was used as another measure of provider adherence to hypertension guidelines. Of note, this tool was designed to measure adherence to the JNC 7 guidelines for the management and treatment of hypertension. However, none of the criteria is different from the JNC 8 recommendations. Mean overall provider adherence in the present study was $71\% \pm 14.8\%$. This is higher than the mean overall provider adherence of $53.5\% \pm 16.2\%$ Ardery et al. (2007) reported when using the same tool to study provider adherence. Differences in adherence rates between the two studies may be due to vastly different patient demographics. Ardery et al.’s (2007) population was 71.4% white, 61.3% female, with a mean age of 60 years old, compared to the present study which was 37% African American, 31.5% white, 50.9% female, with a mean age of 50 years old. In the present study, no significant difference was found between the mean overall adherence scores of the two care groups, with ACT team patients having a mean overall provider adherence rate of $70\% \pm 13.8\%$, and Health Home patients having a mean overall provider adherence rate of $71.3\% \pm 14.8\%$. 
It is important to note that almost all patients included in this study (95.9%) had at least one other cardiovascular disease risk factor apart from hypertension, and patients in this study had a mean number of 3.38 CVD risk factors, including hypertension. This is important because it highlights that the care of patients diagnosed with hypertension must include working to decrease the patient’s additional risk factors for CVD including smoking cessation, weight reduction, and management of their comorbid conditions including diabetes mellitus, chronic kidney disease, and dyslipidemia. This study also found a significant difference between the mean number of cardiovascular disease risk factors in ACT team patients and Health Home patients. This supports the large body of evidence in the literature that individuals with serious mental illness are at increased risk for cardiovascular events as compared to the general population (Colton & Manderscheid, 2006; De Hert et al., 2009; Newcomer & Hennekens, 2007).

It is recommended that a baseline EKG is obtained for every individual diagnosed with hypertension (Ardery et al., 2007). An EKG was present only 22.1% of the time (103 out of 466 visits). This represents 366 missed opportunities to obtain an EKG on a patient diagnosed with hypertension at this practice during the study period. This study’s rate of EKG documentation is less than rates previously documented in the literature which ranged from 41.5-62% (Ardery et al., 2007; Jami et al., 2007). This may be due to many factors, including availability of equipment and time demands on staff, which will need to be addressed in order to provide the required testing to all patients in the practice. The most common missing laboratory test in this study was urine micro-albumin level which was missing in 14% of visits of patients with diabetes or chronic kidney disease. This is less than documented rates of missing urine micro-albumin levels in the literature which ranges between 49-70.9% missing, this in part may be due
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to availability of laboratory sample collection on site at the studied practice (Ardery et al., 2007; Jami et al., 2007).

Strengths

The JNC 8 recommendations for the management for hypertension are still relatively recent, having been published in 2014, and many practices are still working on incorporating these guidelines into their practice. Although multiple studies have been published on provider adherence to other hypertension guidelines, including the JNC 7 guidelines, this is the first study to analyze provider adherence to the JNC 8 guidelines. Additionally, this is the first study to analyze provider adherence to hypertension guidelines in a patient population with serious mental illness and compare it to a control group within the same practice, managed by the same providers.

Limitations

This study was conducted in a small practice which has been open for less than five years, which limited the sample size of the study to 108 patients and 466 office visits. Additionally, there was almost three times the number of Health Home patients (n=74) included in this study than ACT team patients (n=25). These unequal sample sizes may have affect the results of analyses of adherence rates between the two groups.

This study compared provider adherence rates between two groups of patients: ACT team patients and patients who qualify for NYS Health Home. Although Health Home patients are not as functionally impaired (frequent hospitalizations, legal problems) due to serious mental illness as patients on the ACT team are, many Health Home patients in this study have mental health diagnoses which increase the complexity of the medical care. This study did not control for
mental health diagnosis, and therefore the results may not be generalizable to the entire population.

Also, because it was conducted in a single practice site in Buffalo, New York, the results of this study may not be generalizable to the rest of the country. However, the results of this study were in many cases similar to the findings of similar studies assessing provider adherence to hypertension guidelines, so some external validity can be assumed. Additionally, the providers at this practice frequently have office visits with each other’s patients, so this study was not able to stratify and compare adherence rates based on provider.

Another limitation of this study is that it was a retrospective chart review, so the data collection was based on what is available in the patients’ charts. Incomplete or inaccurate charting can affect the results of the study. For example, the provider could have provided patient education on lifestyle modifications and medication adherence and/or intensification which were not charted. There was no way to differentiate between poor record keeping and non-adherence to the guidelines. Additionally, due to the retrospective nature of this study, there was no way to ensure that the blood pressure measurements used were taken accurately.

The results of this study should be viewed through the lens of its theoretical framework, Stokols’ (1992) Social Ecology Model for Health Promotion. Patients’ health behaviors, such as non-adherence to prescribed medications, are influenced by their physical environment, social environments, and individual traits (Sallis, Owen, & Fisher, 2008; Stokols, 1992). This study was conducted in an urban family medicine clinic with patients from diverse ethnic and cultural backgrounds, the majority of whom were from disadvantaged socioeconomic status and had a mental health diagnosis. As Stokols’ (1992) second concept illustrates, this human environment that the study took place in was complex and multidimensional in nature. It is important to draw
conclusions on the results of this study with the understanding that guidelines for management of physical diagnoses cannot always account for individual patient differences and complexities. Providers may need to modify the implementation of a guideline in order to meet patient needs. Providers also must be aware that they may need to design and implement interventions aimed at modifying their patient’s environment, for example using pharmacies that mail medications directly to the patient’s residence if the patient lacks transportation, in order to improve health outcomes.

**Implications for Practice**

Adherence to the guidelines for the management of hypertension will never be one hundred percent because guidelines are created based on population health and do not always account for patient specific characteristics and considerations. Providers should aim to implement and follow clinical guidelines in the practice in order to provide the highest quality of evidence-based disease prevention, management, and treatment to their patients, while exercising clinical judgment in the care of patients to whom the guidelines are not applicable due to special circumstances. Clinical inertia contributes significantly to the under treatment of hypertension, and providers must work to eliminate their own biases and factors which contribute to clinical inertia in the management of hypertension of their patients (Harle et al., 2013; Kronish et al., 2016; Lebeau et al., 2014).

The results of this study indicate that a significant way providers can decrease their contribution to the clinical inertia in the treatment of hypertension of their patients is to be cognizant that any blood pressure of ≥140/90 mmHg (≥150/90 mmHg for sixty years of age or greater) is not borderline, and has crossed the evidence-based threshold where treatment is necessary. The American College of Cardiology and American Heart Association have addressed
therapeutic inertia in their 2017 guidelines by decreasing the threshold for the diagnosis of hypertension to a SBP 130-139 mmHg or DBP 80-89 mmHg, while maintaining the threshold for treatment for most patients to be SBP ≥ 140 mmHg or DBP ≥ 90 mmHg (Whelton et al., 2017). Providers should also be aware that if a patient’s SBP is ≥160 mmHg or DBP ≥100 mmHg, the patient should be prescribed two or more antihypertension medication classes to order to obtain blood pressure control.

The results of this study also highlight the need for providers to approach the management of hypertension in their patients holistically in order to prevent cardiovascular events. Healthy diet, sodium intake reduction, weight loss, exercise, smoking cessation instruction, and alcohol intake reduction not only can improve blood pressure control, they are also essential to decreasing CVD risk. Additionally, effective management of patient comorbidities, including dyslipidemia, diabetes, and chronic kidney disease is very important to the prevention of cardiovascular events in the patient diagnosed with hypertension. This is true for all patients, but especially for patients with serious mental illness who have significantly increased risk for cardiovascular morbidity and mortality.

Finally, it is important that providers obtain a baseline EKG on all patients diagnosed with hypertension. Additionally, fasting lipid profiles, hematocrit, potassium, calcium, creatinine, blood glucose levels, and in patients with diabetes or CKD a urine micro-albumin level should be checked at least annually to screen for and manage comorbid conditions which can increase cardiovascular risk.

As doctorally prepared Advanced Practice Nurses, it is important that we continuously evaluate the delivery and outcomes of the health care we provide. Evaluating guideline
adherence is an essential part of quality improvement in a practice to ensure that patients are receiving the most up-to-date, evidence-based care.

**Conclusion**

This study found a 60.3% provider adherence rate to the JNC 8 guidelines for the management for hypertension the UBMD Family Medicine Clinic co-located in Best Self Behavioral Health. The top three reasons documented by providers for failure to intensify antihypertensive therapy when recommended by the guidelines in this study were patient non-adherence to medications, borderline blood pressure, and patient out of their medications. No significant difference was found between provider adherence rates to the JNC 8 guidelines for patients who were part of the ACT team and patients who were part of the NYS Health Home. Further research is necessary to see if these results are generalizable to larger populations.
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Lebeau, J. P., Cadwallader, J. S., Aubin-Augier, I., Mercier, A., Pasquet, T., Rusch, E., ...


Table 1

*Selected Demographics for the Study Population*

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
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<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>53 (49.1)</td>
</tr>
<tr>
<td>Female</td>
<td>55 (50.9)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
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<tr>
<td>Black</td>
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<td>White</td>
<td>34 (31.5)</td>
</tr>
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<td>Multiracial</td>
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<tr>
<td>American Indian</td>
<td>3 (2.8)</td>
</tr>
<tr>
<td>Not Reported</td>
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<td>ACT Team</td>
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<td>74 (68.5)</td>
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<td>9 (8.3)</td>
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*Note. N = 108.*
Table 2

*Overall Visit Adherence to Guidelines for Intensification*

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<tr>
<th>Variable</th>
<th>Intensification Action</th>
<th>n (%)</th>
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<tbody>
<tr>
<td>Intensification Required</td>
<td>Yes</td>
<td>242 (51.9)</td>
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<tr>
<td></td>
<td>No</td>
<td>224 (48.1)</td>
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<tr>
<td>Intensification Occurred</td>
<td>Yes/Required</td>
<td>61 (13.1)</td>
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<tr>
<td></td>
<td>Yes/Not Required</td>
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<tr>
<td></td>
<td>No/Required</td>
<td>181 (38.8)</td>
</tr>
<tr>
<td></td>
<td>No/Not Required</td>
<td>220 (47.2)</td>
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<tr>
<td>Adherent to Guidelines</td>
<td>Yes</td>
<td>281 (60.3)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>185 (39.7)</td>
</tr>
</tbody>
</table>

*Note.* N = 466 office visits.
Table 3

*Adherence to the Guidelines for Intensification Based on Selected Characteristics*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adherent Visits</th>
<th>Total Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n</td>
</tr>
<tr>
<td>SBP*</td>
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</tr>
<tr>
<td>&lt;140 mmHg</td>
<td>211 (75.9)</td>
<td>278</td>
</tr>
<tr>
<td>140-149 mmHg</td>
<td>25 (33.3)</td>
<td>75</td>
</tr>
<tr>
<td>150-159 mmHg</td>
<td>20 (44.4)</td>
<td>45</td>
</tr>
<tr>
<td>160-179 mmHg</td>
<td>20 (50.0)</td>
<td>40</td>
</tr>
<tr>
<td>≥180 mmHg</td>
<td>9 (32.1)</td>
<td>28</td>
</tr>
<tr>
<td>DBP*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;90 mmHg</td>
<td>236 (86.4)</td>
<td>273</td>
</tr>
<tr>
<td>90-99 mmHg</td>
<td>12 (10.6)</td>
<td>113</td>
</tr>
<tr>
<td>100-109 mmHg</td>
<td>25 (51.0)</td>
<td>49</td>
</tr>
<tr>
<td>≥100 mmHg</td>
<td>12 (38.7)</td>
<td>31</td>
</tr>
<tr>
<td>Comorbidity of DM*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>87 (63.0)</td>
<td>138</td>
</tr>
<tr>
<td>No</td>
<td>198 (60.4)</td>
<td>328</td>
</tr>
<tr>
<td>Care Group**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT Team</td>
<td>48 (55.2)</td>
<td>87</td>
</tr>
<tr>
<td>Health Home</td>
<td>223 (62.3)</td>
<td>358</td>
</tr>
</tbody>
</table>

*Note.* SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; DM = Diabetes Mellitus. *N = 466. **N = 445, data on care group was not available for 9 visits.
Table 4

Chi-Square Analysis for Adherence to the Guidelines for Intensification and Selected Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP</td>
<td>67.186</td>
<td>4</td>
<td>.000*</td>
</tr>
<tr>
<td>DBP</td>
<td>203.692</td>
<td>3</td>
<td>.000*</td>
</tr>
<tr>
<td>DM</td>
<td>.293</td>
<td>1</td>
<td>.588</td>
</tr>
<tr>
<td>Care Group</td>
<td>1.489</td>
<td>1</td>
<td>.222</td>
</tr>
</tbody>
</table>

*Note. SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; DM = Diabetes Mellitus. *$p<.05$*
Table 5

Classes of Antihypertensive Medication Prescribed

<table>
<thead>
<tr>
<th>Variable</th>
<th>Visits</th>
<th>African American</th>
<th>Other Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiazide</td>
<td>34 (7.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACE</td>
<td>54 (11.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARB</td>
<td>26 (5.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCB</td>
<td>30 (6.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Class</td>
<td>25 (5.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two Classes</td>
<td>141 (30.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three Classes</td>
<td>68 (14.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 3 Classes</td>
<td>19 (4.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Meds</td>
<td>69 (14.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class Appropriate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>335 (84.4)</td>
<td>129 (83.2)</td>
<td>189 (86.7)</td>
</tr>
<tr>
<td>No</td>
<td>62 (15.6)</td>
<td>26 (18.6)</td>
<td>29 (13.3)</td>
</tr>
</tbody>
</table>

Note. Thiazide= Thiazide Diuretic; ACE= Angiotensin Converting Enzyme Inhibitor; ARB= Angiotensin Receptor Blocker; CCB= Calcium Channel Blocker. *N = 466 visits. **N ≠ 466 because not all patients were prescribed antihypertensive therapy.
Table 6

*Documented Reasons for Non-adherence to Guidelines for Antihypertensive Medication Class*

<table>
<thead>
<tr>
<th>Reason</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribed by Previous PCP</td>
<td>29 (67.4)</td>
</tr>
<tr>
<td>Used for Comorbidity</td>
<td>7 (16.3)</td>
</tr>
<tr>
<td>Hospital Discharge on Med</td>
<td>4 (9.3)</td>
</tr>
<tr>
<td>Adverse Effects of Recommended Meds</td>
<td>3 (7.0)</td>
</tr>
</tbody>
</table>

*Note.* PCP = Primary Care Provider. N = 43 visits in which a reason was documented.
Table 7

**Chi-Square Analysis for Adherence to the Guidelines for Medication Class and Selected Characteristics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td>.868</td>
<td>1</td>
<td>.351</td>
</tr>
<tr>
<td>SBP/Number of Classes</td>
<td>34.958</td>
<td>4</td>
<td>.000*</td>
</tr>
</tbody>
</table>

*Note. SBP = Systolic Blood Pressure. *\( p < .05 \)
### Table 8

*Explicit Criteria for Adherence Tool Scores*

<table>
<thead>
<tr>
<th>Adherence Criteria</th>
<th>All Cases</th>
<th>ACT Team</th>
<th>Health Home</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n Mean</td>
<td>SD</td>
<td>n Mean</td>
</tr>
<tr>
<td>Overall Score</td>
<td>466 .710</td>
<td>.146</td>
<td>87 .700</td>
</tr>
<tr>
<td>Drug Therapy Score</td>
<td>401 .878</td>
<td>.328</td>
<td>69 .783</td>
</tr>
<tr>
<td>Follow-Up Score</td>
<td>456 .589</td>
<td>.394</td>
<td>84 .592</td>
</tr>
</tbody>
</table>

*Note. N ≠ 466 because tool was scored based on applicability of criteria.*
Table 9

*Comparison of Mean Adherence Tool Scores Between Care Groups*

<table>
<thead>
<tr>
<th>Adherence Criteria</th>
<th>t-Test for Equality of Means</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t</td>
<td>df</td>
</tr>
<tr>
<td>Overall Score</td>
<td>-.736</td>
<td>443</td>
</tr>
<tr>
<td>Drug Therapy Score</td>
<td>-2.107</td>
<td>85.261</td>
</tr>
<tr>
<td>Follow-Up Score</td>
<td>-.067</td>
<td>433</td>
</tr>
</tbody>
</table>

*Note. *p* < .05
Table 10

**Cardiovascular Risk Factors**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Visits*</th>
<th>ACT Team**</th>
<th>Health Home**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Risk Factor Present (Not Including HTN)?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>447 (95.9)</td>
<td>87 (100.0)</td>
<td>339 (94.7)</td>
</tr>
<tr>
<td>No</td>
<td>19 (4.1)</td>
<td>0 (0)</td>
<td>19 (5.3)</td>
</tr>
<tr>
<td><strong>Number of CVD Risk Factors (Including HTN)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>23 (4.9)</td>
<td>0 (0)</td>
<td>23 (6.4)</td>
</tr>
<tr>
<td>2</td>
<td>81 (17.4)</td>
<td>13 (14.9)</td>
<td>67 (18.7)</td>
</tr>
<tr>
<td>3</td>
<td>150 (32.2)</td>
<td>45 (51.7)</td>
<td>89 (24.9)</td>
</tr>
<tr>
<td>4</td>
<td>140 (30.0)</td>
<td>27 (31.0)</td>
<td>113 (31.6)</td>
</tr>
<tr>
<td>5</td>
<td>52 (11.2)</td>
<td>2 (2.3)</td>
<td>46 (12.8)</td>
</tr>
<tr>
<td>6</td>
<td>20 (4.3)</td>
<td>0 (0)</td>
<td>20 (5.6)</td>
</tr>
</tbody>
</table>

*Note.* HTN= hypertension; CVD= cardiovascular disease. *N = 466 visits. **N ≠ 466 due to care group was not reported in 21 visits.*
Table 11

*Number of Cardiovascular Risk Factors*

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Cases*</th>
<th></th>
<th>ACT Team**</th>
<th></th>
<th>Health Home**</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Number of CVD Risk Factors (Including HTN)</td>
<td>466</td>
<td>3.38</td>
<td>1.167</td>
<td>87</td>
<td>3.21</td>
<td>.718</td>
</tr>
<tr>
<td></td>
<td>358</td>
<td>3.42</td>
<td>1.265</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* HTN= hypertension; CVD= cardiovascular disease. *N = 466 visits **N ≠ 466 due to care group was not reported in 21 visits.
Table 12

*Comparison of Mean Number of Cardiovascular Risk Factors and Selected Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care Group</td>
<td>-2.136</td>
<td>233.014</td>
<td>.034*</td>
<td>-.418</td>
<td>-.017</td>
</tr>
<tr>
<td>Adherence to JNC 8</td>
<td>-.305</td>
<td>464</td>
<td>.761</td>
<td>-.252</td>
<td>.184</td>
</tr>
</tbody>
</table>

*Note. HTN= hypertension; CVD= cardiovascular disease. *p<.05.
Table 13

*Diagnostic Testing*

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EKG in chart*</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>103 (22.1)</td>
</tr>
<tr>
<td>No</td>
<td>363 (77.9)</td>
</tr>
<tr>
<td>Appropriate Laboratory Tests Ordered**</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>313 (74.5)</td>
</tr>
<tr>
<td>No</td>
<td>107 (23.0)</td>
</tr>
<tr>
<td>Missing Laboratory Tests***</td>
<td></td>
</tr>
<tr>
<td>CBC</td>
<td>25 (6.0)</td>
</tr>
<tr>
<td>CMP</td>
<td>25 (6.0)</td>
</tr>
<tr>
<td>Lipid Panel</td>
<td>42 (10.0)</td>
</tr>
<tr>
<td>Urine Microalbumin</td>
<td>59 (14.0)</td>
</tr>
</tbody>
</table>

*Note.* *N* = 466 visits. **N = 420, data not collected for 46 visits. ***N = 151 missing lab tests.
Dear TERESA SION:

On 10/3/2017, the IRB reviewed the following submission:

<table>
<thead>
<tr>
<th>Type of Review:</th>
<th>Initial Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of Study:</td>
<td>Provider Adherence to the JNC 8 Guidelines in an Integrated Primary Care and Behavioral Health Setting</td>
</tr>
<tr>
<td>Investigator:</td>
<td>TERESA SION</td>
</tr>
<tr>
<td>IRB ID:</td>
<td>STUDY00001839</td>
</tr>
</tbody>
</table>

Documents Reviewed:
- HRP-503 Protocol, Category: IRB Protocol;
- Explicit Criteria for Adherence Tool, Category: Other;
- Data Collection Sheet, Category: Other;
- HRP 612 - HIPAA Waiver, Category: Other;
- HRP-612 HIPAA Waiver, Category: Consent Form

The IRB approved the study from 10/3/2017 to 10/2/2018 inclusive. The Initial study materials for the project referenced above were reviewed and approved by the SUNY University at Buffalo IRB (UBIRB) by Non-Committee Review. Before 10/2/2018 or within 30 days of study closure, whichever is earlier, you are to submit a continuing review application with required explanations. You can submit a continuing review application by navigating to the active study in Click IRB and selecting ‘Create Modification / CR’. Studies cannot be conducted beyond the expiration date without re-approval by the UBIRB.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system.

Based on the information you have provided in the “University at Buffalo Human Research Protections Program Request for Full Waiver of Individual Authorization for Use of Individually Identifiable Health
Appendix A Continued

Information” form (waiver request), the UBIRB has determined a full waiver of the individual authorization required by 45 CFR §164.508 for use or disclosure of protected health information is warranted based on the following criteria as specified in 45 CFR 164.512(i) (2). Accordingly:

A) The use or disclosure of protected health information involves no more than a minimal risk to the privacy of individuals, based on, at least, the presence of the following elements:

1) An adequate plan to protect the identifiers from improper use and disclosure;

   2) An adequate plan to destroy the identifiers at the earliest opportunity consistent with conduct of the research, unless there is a health or research justification for retaining the identifiers or such retention is otherwise required by law; and

   3) Adequate written assurances that the protected health information will not be reused or disclosed to any other person or entity, except as required by law, for authorized oversight of the research study, or for other research for which the use or disclosure of protected health information would be permitted by this subpart;

B) The research could not practicably be conducted without the waiver or alteration; and

C) The research could not practicably be conducted without access to and use of the protected health information.

A brief description of the Protected Health Information for which this alteration or waiver has been granted is provided on the “Request for Waiver of the Authorization for Use of Individually Identifiable Health Information” or “Request for Limited Waiver of the Authorization for Use of Individually Identifiable Health Information for Study Recruitment” which is part of this approval. If HIV information is requested, this waiver is only valid for disclosures consistent with New York Code Public Health Article 27-F.

This full waiver has been reviewed and approved for the above referenced study by the UBIRB to permit you to receive personal health information as specified in section (1) of the waiver request.

UBIRB approval is given with the understanding that the most recently approved procedures will be followed and the most recently approved consent documents will be used. If modifications are needed, those changes may not be initiated until such modifications have been submitted to the UBIRB for review and have been granted approval.

As principal investigator for this study involving human participants, you have responsibilities to the SUNY University at Buffalo IRB (UBIRB) as follows:

1. Ensuring that no subjects are enrolled prior to the IRB approval date.
Appendix A Continued

2. Ensuring that the study is not conducted beyond the expiration date without re-approval by the UBIRB.

3. Ensuring that the UBIRB is notified of:
   All reportable information in accordance with the New Information SOP (HRP-024).
   
   - Project closure/completion by submitting a Continuing Review/Modification submission.

4. Ensuring that the protocol is followed as approved by UBIRB unless a protocol amendment is prospectively approved.

5. Ensuring that changes in research procedures, recruitment or consent processes are not initiated without prior UBIRB review and approval, except where necessary to eliminate apparent immediate hazards to subjects.

6. Ensuring that the study is conducted in compliance with all UBIRB decisions, conditions, and requirements.

7. Bearing responsibility for all actions of the staff and sub-investigators with regard to the protocol.

8. Bearing responsibility for securing any other required approvals before research begins.

If you have any questions, please contact the UBIRB at 716-888-4888 or ub-irb@buffalo.edu. Please include the project title and number in all correspondence with the UBIRB.
Appendix B

Data Collection Sheet

ID # __________

Date of Service __________

Age __________

Sex

1. Male
2. Female
3. Other

Diagnosis

1. I10
2. R03.0

SBP __________

SBP Category

1. <140 mmHg
2. 140-149 mmHg
3. 150-159 mmHg
4. 160-179 mmHg
5. ≥180 mmHg

DBP __________

DBP Category

1. <90 mmHg
2. 90-99 mmHg
3. 100-109 mmHg
4. ≥110 mmHg

Initiation or Intensification Required?

1. Yes
2. No
Appendix B Continued

Intensification Done?

1. Yes
2. No

Intensification Type

1. Increased Dose
2. Added Medication Class
3. Changed Medication Class

Class of Med Prescribed

1. Thiazide
2. ACE
3. ARB
4. CCB
5. Other
6. Dual Therapy
7. Triple Therapy
8. > 3 med classes
9. No Antihypertensive Medications

Class Appropriate (JNC 8)

1. Yes
2. No

Documented Reason for Inappropriate Class

1. Prescribed by previous PCP
2. Used for Comorbidity
3. Adverse effects of recommended medication classes
4. Hospital discharge on medication

Deviation from Guidelines (Intensification)

1. Yes
2. No
Documented Reason for Deviation (Intensification)

1. Yes
2. No

Reason

1. Patient Non-adherence to meds
2. Patient request
3. Borderline BP
4. Therapy initiated < 2 weeks prior
5. Patient out of medications
6. Check TSH
7. Lifestyle changes first
8. Orthostatic hypotension
9. Tighter control

CVD risk factor present (DM, elevated LDL, elevated total cholesterol, decreased HDL, family history CVD, elevated urine albumin, obesity, tobacco use)?

1. Yes
2. No

DM Present?

1. Yes
2. No

Elevated LDL, elevated total cholesterol, and/or decreased HDL?

1. Yes
2. No
Family history CVD?
   1. Yes
   2. No

Elevated urine albumin?
   1. Yes
   2. No

Obesity?
   1. Yes
   2. No

Tobacco Use?
   1. Yes
   2. No

# of CVD Risk Factors __________

Recommended goal BP documented?
   1. Yes
   2. No

Documented lifestyle modification recommendations?
   1. Yes
   2. No

EKG
   1. Yes
   2. No

Appropriate lab test ordered?
   1. Yes
   2. No
If not what lab is missing? __________

Appropriate follow-up spacing?
   1. Yes
   2. No

Diagnosis Criteria Adherence Score __________

Drug Therapy Adherence Score __________

Follow-up Intensity Adherence Score __________

Lab Monitoring Adherence Score __________

Aggregate Adherence Score __________

ACT or Health Home
   1. ACT
   2. Health Home
   3. Neither

Ethnicity
   1. Hispanic/Latino
   2. Not Hispanic/Latino

Race
   1. Not Reported
   2. Black/African American
   3. Asian
   4. Alaska Native
   5. White
   6. American Indian
   7. Multiracial (2 or more races)
Appendix B Continued

Tobacco Use (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Alcoholic Beverages (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Cannabis (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Cocaine (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Rx Stimulants (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Meth (Past 30 Days)
1. Once or twice
2. Weekly
3. Daily or almost daily
Sedatives or Sleeping Pills (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Street Opioids (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Rx Opioids (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Other Substances (Past 30 days)
1. Once or twice
2. Weekly
3. Daily or almost daily

Nights Homeless (Past 30 days)
1. At least one night

Education
1. <12th grade
2. HS Diploma
3. College
4. College Grad or more
Employment

1. Full time
2. Part time
   3. Unemployed looking
4. Unemployed disabled
5. Unemployed volunteer or retired
6. Unemployed not looking

Waist Circumference

1. Normal
2. High

HbgA1c

1. <5.7%
2. 5.7-6.4%
3. 6.5%+

Total Cholesterol

1. <200 mg/dL
2. 200-239 mg/dL
3. 240+ mg/dL

Triglyceride Level

1. <150 mg/dL
2. 150-199 mg/dL
3. 200-499 mg/dL
Appendix B Continued

CO Level

1. 1-6 ppm
2. 7-10 ppm
3. 10+ ppm
### Appendix C
Explicit Criteria for Adherence Tool

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnosis Criteria</strong></td>
<td></td>
</tr>
<tr>
<td>Major CVD risk factors documented by physician (diabetes, elevated LDL/total cholesterol/low HDL, family history of CVD, elevated urine albumin, obesity, tobacco use)</td>
<td></td>
</tr>
<tr>
<td>Recommended goal blood pressure documented</td>
<td></td>
</tr>
<tr>
<td><strong>Drug Therapy Criteria</strong></td>
<td></td>
</tr>
<tr>
<td>In general non-black population a thiazide diuretic, ACE, ARB, or CCB is prescribed as initial therapy.</td>
<td></td>
</tr>
<tr>
<td>In general black population a thiazide diuretic or CCB is prescribed as initial therapy.</td>
<td></td>
</tr>
<tr>
<td>In patients with CKD ACE or ARB is prescribed as initial or add on therapy</td>
<td></td>
</tr>
<tr>
<td><strong>Follow-up Intensity Criteria</strong></td>
<td></td>
</tr>
<tr>
<td>If BP is above goal, a follow-up visit is scheduled within 4 weeks of last visit</td>
<td></td>
</tr>
<tr>
<td>Patients whose BP is above goal have either an increase in medication or change in medication</td>
<td></td>
</tr>
<tr>
<td>Provider mentions absence of blood pressure control in the progress note</td>
<td></td>
</tr>
<tr>
<td>Progress note documents that lifestyle recommendations have been discussed</td>
<td></td>
</tr>
<tr>
<td><strong>Laboratory Monitoring Criteria</strong></td>
<td></td>
</tr>
<tr>
<td>Fasting lipid panel within 12 months</td>
<td></td>
</tr>
<tr>
<td>If DM or CKD urine albumin in past 12 months</td>
<td></td>
</tr>
<tr>
<td>Blood glucose level in past 12 months</td>
<td></td>
</tr>
<tr>
<td>Hematocrit level in past 12 months</td>
<td></td>
</tr>
<tr>
<td>Potassium level in past 12 months</td>
<td></td>
</tr>
<tr>
<td>Calcium level in past 12 months</td>
<td></td>
</tr>
<tr>
<td>EKG in chart</td>
<td></td>
</tr>
</tbody>
</table>

| **Laboratory Monitoring Criteria Adherence Score** |       |
| **Total Adherence Score**                        |       |
PROVIDER ADHERENCE TO THE JNC 8 GUIDELINES

Purpose
Evaluate provider adherence to the JNC 8 guidelines for the management of hypertension in patients at the UMHS Family Medicine clinic at Best Self Behavioral Health.

Project Questions
- What is the rate of provider adherence to the Eighth Joint National Committee (JNC 8) guidelines for the management of hypertension in patients at the UMHS Family Medicine clinic at Best Self Behavioral Health?
- When deviations from the guidelines are identified, did the provider document a rationale for the deviation (patient factors, provider preferences) in the patient's chart?
- What are the most common reasons for deviation from the guidelines?
- Is there a difference in provider adherence to the JNC 8 guidelines in the management of ACT Team patients versus Health Home patients?

Background
- 2-3-fold increase in mortality rate of individuals with BMI (De-Hert et al., 2009).
- Cardiovascular disease is the leading cause of death in patients with BMI (Colton & Manderscheid, 2006; De-Hert et al., 2009).
- CVD risk factors in patients with BMI (Newcomer & Heineke, 2007):
  - Hypertension
  - Hyperlipidemia
  - Diabetes
  - Obesity
  - Smoking
- In 2016, the UMHS Family Medicine clinic within Best Self Behavioral Health implemented the JNC 8 guidelines for the management of hypertension.
- It is necessary to evaluate the effectiveness of the implementation of the JNC 8 guidelines on this patient population to contribute to the evolving scientific knowledge on best practices for treating physical illnesses in patients with BMI.
PROVIDER ADHERENCE TO THE JNC 8 GUIDELINES

**Literature Review**
- Mortality from CVD has decreased in the general population, but not in patients with BMI (Corbet et al., 2014)
- Over 60% of cases of hypertension in patients with schizophrenia go untreated, similar rates of untreated hypertension exist in all patients with BMI (De Hert, et al., 2009)
- Patients with BMI should be treated for their physical illness utilizing the same evidence-based guidelines used for the general population (De Hert, et al., 2011)

**Theoretical Framework**
- Stockard’s (1962) Social Ecology Model for Health Promotion
  - Derived from systems theory and social ecology theory
  - Conceptualizes health promotion through psychological, organizational, cultural, and policy perspectives emphasizing the dynamic relationship between the individual and their environment (Best, et al., 2003)
  - Four key concepts:
    1. Health behavior is influenced by physical environments, social environments, and personal attributes.
    2. Human environments are complex and multidimensional in nature.
    3. Human-environment interactions occur at various levels of the system.
    4. Individuals influence their environment, and that transformed environment then affects health behaviors.

**METHODOLOGY**

**Design and Setting**
- Descriptive, exploratory retrospective chart review
- UBIAD Family Medicine clinic at Best Self Behavioral Health, co-located primary care and behavioral health practice
- Buffalo, New York
- Population: Adult patients, typically low socioeconomic status, majority of the patient population has at least one behavioral health diagnosis
- Medical, Medicare, and private insurance
- Physician, nurse practitioners, and physician assistant providers
PROVIDER ADHERENCE TO THE JNC 8 GUIDELINES

Variables

- Hypertension
- Non-adherence
- Intensification of therapy
- Appropriateness of medication class
- Number of cardiovascular risk factors

Sample

- Inclusion criteria:
  1. Documentation of diagnosis of either hypertension (ICD-10 code I10, ICD-9 codes 401.0, 401.1) or prehypertension (ICD-10 R03.0, ICD-9 code 719.2)
  2. At least one office visit between February 1, 2016 and August 31, 2017
  3. Age greater than 18 years at time of office visit.

- Exclusion criteria:
  1. Pregnancy during specified study period
  2. Diagnosis of secondary hypertension or hypertensive crisis
  3. Cases receiving dialysis during study period
  4. Cases who are co-managed by a cardiologist

- 105 cases were selected for manual chart reviews.
- All visits during study period were evaluated for each case. (N = 486 visits)

Research Procedures

- University at Buffalo Institutional Review Board approval on October 3, 2017
- Data sources of data:
  1. UBMD Abstracts EMR:
     - Provider adherence to JNC 8
     - Provider rationale for non-adherence
     - Explicit criteria for adherence tool
  2. Best Self SAMHSA database:
     - Patient demographic characteristics and health outcome data

Explicit Criteria for Adherence Tool

Adapted from Nishak et al., (2006).
Data Analysis

- Descriptive statistics - frequencies, percentages
- Comparison of adherence indicators and selected characteristics
- Crosstabs and Pearson’s chi-square tests
- Adherence scores - independent t-tests

Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>65.38</td>
<td>65.38</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>49.97%</td>
<td>50.03%</td>
</tr>
<tr>
<td>Black</td>
<td>44.61%</td>
<td>45.39%</td>
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<tr>
<td>Other</td>
<td>4.42%</td>
<td>4.54%</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
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<tr>
<td>High School</td>
<td>31.41%</td>
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<tr>
<td>Some College</td>
<td>36.41%</td>
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<tr>
<td>College Degree</td>
<td>24.50%</td>
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<tr>
<td>Bachelor’s Degree</td>
<td>9.70%</td>
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<tr>
<td>More than Bachelor’s</td>
<td>1.09%</td>
<td>2.41%</td>
</tr>
<tr>
<td>Annual Income</td>
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<td></td>
</tr>
<tr>
<td>&lt; $30,000</td>
<td>34.13%</td>
<td>31.28%</td>
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<td>33.10%</td>
</tr>
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<td>6.16%</td>
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<tr>
<td>Marital status</td>
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<tr>
<td>Married</td>
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<td>52.75%</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>&lt; $30,000</td>
<td>33.50%</td>
<td>31.28%</td>
</tr>
<tr>
<td>$30,000 - $49,999</td>
<td>30.91%</td>
<td>33.10%</td>
</tr>
<tr>
<td>$50,000 - $74,999</td>
<td>21.13%</td>
<td>17.42%</td>
</tr>
<tr>
<td>$75,000 - $99,999</td>
<td>9.23%</td>
<td>10.01%</td>
</tr>
<tr>
<td>$100,000 or More</td>
<td>4.11%</td>
<td>6.16%</td>
</tr>
<tr>
<td>Education for Dependents</td>
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<tr>
<td>High School</td>
<td>28.57%</td>
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</tr>
<tr>
<td>More than Bachelor’s</td>
<td>0.46%</td>
<td>0.36%</td>
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</tbody>
</table>

Adherence for Intensification

<table>
<thead>
<tr>
<th>Overall Odds of adherence for intensification</th>
<th>Odds Ratio (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>3.00 (1.50)</td>
</tr>
<tr>
<td>No</td>
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Adherence and Select Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education for Dependents</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: n = 120 with 95% CI.
PROVIDER ADHERENCE TO THE JNC 8 GUIDELINES

Adherence and Select Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Case Group</th>
<th>p-Value</th>
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</thead>
<tbody>
<tr>
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<td>67.198</td>
<td>.000*</td>
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<tr>
<td>BMI</td>
<td>30.492</td>
<td>30.303</td>
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<tr>
<td>Gender</td>
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<td>1</td>
<td>.000*</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>1</td>
<td>.000*</td>
</tr>
</tbody>
</table>

Medication Class

<table>
<thead>
<tr>
<th>Class</th>
<th>Total</th>
<th>Case Group</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE Inhibitors</td>
<td>61.78</td>
<td>81.16</td>
<td>.005</td>
</tr>
<tr>
<td>ARBs</td>
<td>38.03</td>
<td>38.00</td>
<td>.000</td>
</tr>
<tr>
<td>ARBs ≤ 40</td>
<td>38.03</td>
<td>38.00</td>
<td>.000</td>
</tr>
<tr>
<td>Dihydrate</td>
<td>81.16</td>
<td>81.16</td>
<td>.000</td>
</tr>
<tr>
<td>Diuretics</td>
<td>81.16</td>
<td>81.16</td>
<td>.000</td>
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</tbody>
</table>

Adherence Tool Score

<table>
<thead>
<tr>
<th>Adherence Tool Score</th>
<th>Case Group</th>
<th>p-Value</th>
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</thead>
<tbody>
<tr>
<td>Overall Score</td>
<td>10.87</td>
<td>10.87</td>
</tr>
<tr>
<td>Drug Therapy</td>
<td>9.64</td>
<td>9.64</td>
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<tr>
<td>Follow Up Score</td>
<td>10.87</td>
<td>10.87</td>
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</table>

CVD Risk Factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Total</th>
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<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td></td>
<td>30.00</td>
<td>.000</td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td>20.00</td>
<td>.000</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td>20.00</td>
<td>.000</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td></td>
<td>20.00</td>
<td>.000</td>
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</table>
Mean Number of CVD Risk Factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>d</th>
<th>p Value</th>
<th>Odds Ratio</th>
<th>95% CI Lower</th>
<th>95% CI Upper</th>
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<tbody>
<tr>
<td>Age</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>BP</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVD</td>
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</tbody>
</table>

Diagnostic Testing

<table>
<thead>
<tr>
<th>Diagnostic Test</th>
<th>Available</th>
<th>Ordered</th>
<th>Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CT scan</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>MRI</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Blood Tests</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Discussion

- Patients were at goal BP in 48.1% of visits
- Providers adhered to the JNC8 guidelines for intensification in 60.3% of visits
- Clinical inertia - “Borderline BP” reason for provider non-adherence 23.1% of visits
- Adherence and SBP/DBP reading
- No association found between adherence and care group
- Antihypertension medication classes appropriate in 84.4% of visits
- EKG in chart in 22.1% of visits

Implications to Practice

- Any BP of 140/90 mmHg (or 160/90 mmHg for 60 of age or greater) is not borderline, should be treated to reduce clinical inertia
- Approach management of hypertension holistically, to reduce CVD risk factors
- Need effective management of patient comorbidities to prevent cardiovascular events
- Importance of obtaining baseline EKG, annual fasting lipid profiles, CBC, BMP, and urine micro-albumin level in patients with diabetes or CKD
- DNP must continuously evaluate the delivery and outcomes of the health care
PROVIDER ADHERENCE TO THE JNC 8 GUIDELINES

Strengths and Limitations
- First study to analyze provider adherence to the JNC 8 guidelines
- Analyzed provider adherence to hypertension guidelines in patients with BMI and a control group within the same practice, managed by the same providers
- Single practice site, limited sample size, unequal sample sizes of care groups
- Did not control for mental health diagnosis
- Unable to compare providers
- Explicit criteria for adherence tool was developed and validated for JNC 7
- Retrospective chart review—posible incomplete documentation
- Quality of blood pressure measurements unknown

Conclusion
- 63.3% provider adherence rate to the JNC 8 guidelines
- Top 3 reasons failure to intensify antihypertensive therapy:
  1. Patient non-adherence to medications
  2. Borderline blood pressure
  3. Patient out of their medications
- No significant difference in adherence rates based on care group

References

References Continued
References Continued