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Original Study

Evaluating the Prescribing Patterns of Antihypertensive Medications in a Student-Run Free Clinic

Sandra Cabezas[1]; Kahkashan Grant[1]; John Clark, PharmD, MS, FASHP, FFSHP[2]

[1]University of South Florida Taneja College of Pharmacy, Tampa, Florida, USA
[2]Department of Pharmacotherapeutics & Clinical Research, University of South Florida Taneja College of Pharmacy, Tampa, Florida, USA

Corresponding Author: Sandra Cabezas; email: scabezas1@usf.edu

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Abstract

Background: Hypertension is one of the most widespread disease states and a high-risk factor for developing other cardiovascular diseases such as stroke and coronary disease. In the uninsured population, uncontrolled blood pressure is primarily due to limited access to healthcare. While there has been a review to assess the quality of hypertension management provided at the Building Relationships and Initiatives Dedicated to Gaining Equality (BRIDGE) Clinic, this study will evaluate the prescribing patterns of antihypertensives at the clinic and assess whether the clinic is adhering to current treatment guidelines.
Methods: A retrospective chart review was performed for BRIDGE patients 18 years and older that were diagnosed with hypertension between 2012 and 2021. The drug classes studied included thiazide diuretics, calcium channel blockers (CCBs), angiotensin-converting-enzyme inhibitors (ACEI), and angiotensin receptor blockers (ARBs). The initial and maintenance doses were compared to Food and Drug Administration (FDA)-recommended dosing to determine if the appropriate doses were prescribed.
Results: A total of 123 patient charts were reviewed. 54.7% of patients with Stage 1 hypertension were initially started on only one medication. For Stage 1 maintenance, 47.3% of the patients were continued on only one medication. In patients with Stage 2, 45.8 % were initially started on a combination of 2 or more medications. For Stage 2 maintenance, 79.2% of the patients were continued on a combination of 2 or more medications. Patients with Stage 1 had prescribing patterns that did not adhere to guidelines while most Stage 2 patients adhered to guidelines.
Conclusions: The results suggest that the BRIDGE Healthcare Clinic may be prescribing antihypertensive medications that do not entirely follow the prescribing patterns recommended by the Joint National Committee (JNC) 8 guidelines, which may impact effective treatment outcomes.

Background

Hypertension is one of the most widespread disease states and a high-risk factor for developing other cardiovascular diseases such as stroke and coronary disease. Treatment guidelines recommended by the Eighth Report of the Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure (JNC 8), which was published in 2013, recommended using a stepwise approach in prescribing antihypertensive medications.[1] The guidelines identify five primary drug classes used: thiazide diuretics, calcium channel blockers (CCBs), beta-blockers (BBs), angiotensin converting enzyme inhibitors (ACEIs), and angiotensin receptor blockers (ARBs). Each of these drug classes utilize different mechanisms of action to decrease blood pressure and fit into different stages in the treatment algorithm. According to the JNC 8 treatment algorithm, if a patient is diagnosed with stage I hypertension, they should be started

on a thiazide diuretic as a first-line treatment option. If a patient is diagnosed with stage II, then an additional medication from one of the other drug classes identified in the guidelines should be added along with the thiazide diuretic. If these first-line treatment options do not result in lowering the patient's blood pressure, then changes in their dosages or additional medications should be considered in order to achieve goal blood pressure. The JNC 8 guidelines define goal blood pressure for individuals with hypertension to be under 140/90 in patients less than 60 years old and under 150/90 in patients greater than 60 years old.[2]

In the uninsured population, uncontrolled blood pressure is primarily due to limited access to healthcare and can lead to additional costs of care, as more complications can arise such as cardiovascular and renal disease. The Building Relationships and Initiatives Dedicated to Gaining Equality (BRIDGE) Healthcare Clinic is an interdisciplinary student-run free clinic that gives access to healthcare to underserved and uninsured individuals of low socioeconomic background in Tampa, Florida. While there has been a review conducted in the past to assess the quality of hypertension management provided at the BRIDGE Healthcare Clinic in terms of improvements in blood pressure measurements over a period of time,[3] this study evaluated the prescribing patterns of antihypertensives at the clinic and assessed whether the clinic is adhering to current treatment guidelines. Previous published studies conducted in a clinical setting have shown that there is a correlation between improved blood pressure control and adherence to treatment algorithms recommended by the JNC guidelines.[4] Using this data, we hope to identify areas in which pharmacy students can intervene and assist the interdisciplinary team at BRIDGE in properly adhering to nationally quality standards and care guidelines to continue to provide a high level of care for the underserved patients at the BRIDGE Healthcare Clinic.

Study Objectives

The purpose of this study was to determine if patients at the BRIDGE Healthcare Clinic were receiving the correct initial and maintenance medications prescribed for hypertension based on the JNC 8 guidelines for treatment of hypertension. The drug classes that were studied included thiazide diuretics, CCBs, BBs, ACEIs, and ARBs. The study aim was to help identify areas of improvement in prescribing patterns of antihypertensive medications where the pharmacy team could intervene to ensure that the interdisciplinary team is adhering to current treatment guidelines in order to maximize the quality of care patients receive at the BRIDGE Healthcare Clinic.

Methods

A retrospective chart review was conducted of patients at the BRIDGE Healthcare Clinic for whom a diagnosis of hypertension was established and antihypertensive medications were initiated. Investigators utilized Practice Fusion (2021, Practice Fusion, San Francisco, CA) electronic health records (EHR) where patient data was extracted onto a data collection sheet based on patient demographics (age, gender, race, and body mass index, initial and most recent blood pressure measurements, staging of hypertension, medications prescribed at the time of diagnosis, and maintenance medications at the most recent visit. This study was an Institutional Review Board-exempt quality improvement project.

The medication names collected from the patient data collection sheet were organized into a master sheet and sorted into their respective drug classes (thiazide diuretics, CCBs, BBs, ACEIs, and ARBs). Data was collected from new and established patients seen between December 1st, 2012, and December 1st, 2021. Inclusion criteria were patients 18 and older seen at the BRIDGE Healthcare Clinic between December 1st, 2012, and December 1st, 2021, for whom a diagnosis of hypertension was established at the time of visit at BRIDGE and antihypertensive medications were initiated. Exclusion criteria included patients who were previously started on antihypertensive medications prior to becoming a patient at the BRIDGE Clinic. Due to different recommendations on prescribing antihypertensive medications, patients with history of renal disease, cancer, organ transplantation, or congestive heart failure were excluded from the study.

The de-identified data extracted from Practice Fusion EHR contained numerical values assigned to each patient (e.g., 1, 2 ,3 ,4, etc.). The de-identified patient data collection sheet and master sheet were both uploaded into a shared folder on the University of South Florida (USF) Health Box system (an encrypted, password-protected online cloud), to which all approved study team members had access. The data collected was analyzed using the SPSS (Version 28, IBM, Armonk, NY) statistics software. Both the data collection sheet and the master sheet were maintained by the primary investigator throughout the entirety of the study.

Results

A total of 123 patient charts were reviewed with an initial diagnostic code for hypertension at the BRIDGE Clinic. The mean age of patients included in the study was 59 years old, with 60.2% of the patients being female. In total, 52% identified as Hispanic. Patient characteristics and demographics are shown in Table 1. 43.1% of the patients were Stage 1, 19.5% were Stage 2, and 32.5% were pre-hypertensive. 54.7% of patients with Stage 1 hypertension were initially started on only one medication with 5.7% of patients being started on a thiazide diuretic. For maintenance of their hypertension, 47.3% of the patients were continued on only one medication.

45.8 % of patients with Stage 2 hypertension were initially started on a combination of 2 or more medications. For maintenance of their hypertension, 79.2% of the patients were continued on a combination of 2 or more medications. 97.5% of patients that were staged as pre-hypertensive were initially started on an antihypertensive medication and 87.5% were continued on maintenance medications. Initial and maintenance medications for each drug class and their uses in different stages of hypertension are shown in Figure 1.

Table 1. Demographics and patient characteristics of patients diagnosed with hypertension at the BRIDGE Clinic from 2012 to 2021

Characteristic	**Mean ± SD**
Age	59 ± 11
BMI	32.3 ± 6
Gender, n (%)	
Male	49 (39.8%)
Female	74 (60.2%)
Race	
White	41 (33.3%)
Black/African American	10 (8.1%)
Asian	1 (0.8%)
Native	1 (0.8%)
Hawaiian/Other Pacific Islander	
American Indian/Alaskan	1 (0.8%)
Other	38 (30.9%)
Declined to specify	31 (25.2%)

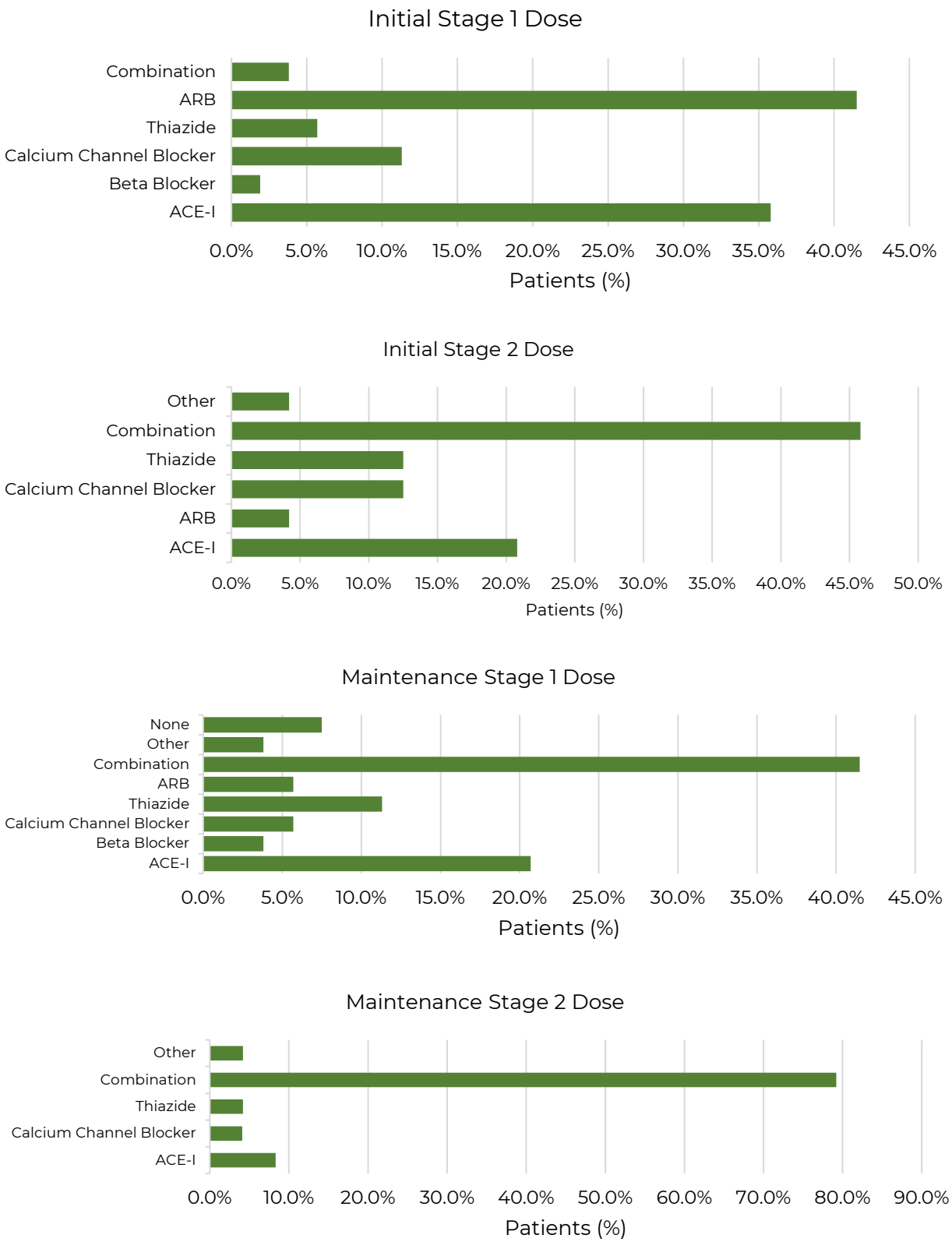
SD: standard deviation; BMI: body mass index

Discussion

Current hypertension guidelines established by the Joint National Committee (JNC) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure classifies blood pressure measurements as normal, pre-hypertension, Stage 1, and Stage 2. Current JNC 8 guidelines recommend that all Stage 1 patients be started on only one medication, preferably from the thiazide drug class, as a first-line treatment. The guidelines recommended that patients with Stage 2 be started on a combination of two or more medications as a first-line therapy. Patients classified as being prehypertensive are recommended to have non-pharmacologic interventions, such as lifestyle and diet modifications, as first-line treatment.[1]

A retrospective study was conducted by Asch et al to analyze the adherence to hypertension guidelines recommendations in 234 female patients.[4] This study revealed that 64% of the patients in this study were receiving the recommended care according to criteria established by JNC guidelines. When looking at the initial treatment at the time of diagnosis, analysis of prescribing patterns of patients diagnosed with hypertension at the BRIDGE Clinic reveals that patients had a lower prevalence of being started on initial first-line treatment that is consistent with current JNC guidelines recommendations for both Stage 1 (54.7%) and Stage 2 (45.8%) hypertension when compared to other previous

Figure 1. Drug classes used in initial and maintenance treatment of Stage 1 and 2 hypertension



ARB: angiotensin receptor blocker; ACE-I: angiotensin-converting enzyme inhibitor

studies on adherence to hypertension guidelines. There was also an increased prevalence of pharmacological intervention in patients classified with prehypertension at the BRIDGE clinic, which does not follow current guidelines recommendations.

The goal of this study was to determine whether the BRIDGE Healthcare Clinic was properly prescribing hypertension medications based on evidenced-based guidelines. Results from this study suggest that the BRIDGE Healthcare Clinic may be prescribing antihypertensive medications that do not entirely follow the prescribing patterns recommended by the JNC 8 guidelines, which may impact effective treatment outcomes. Overall, the outcomes of this study indicate that there are aspects of prescribing patterns in which the pharmacy team can intervene to provide better services to future patients that may lead to decrease in costs associated with antihypertensive medications.

Currently, there is no direct protocol in place that ensures the adherence of evidenced-based prescribing patterns of antihypertensive medication in the clinic setting. However, these results support the benefits of interventions by pharmacy students on an interdisciplinary team that would work to assist in providing both pharmacologic and non-pharmacologic interventions that ensure that the interdisciplinary team is adhering to recommended prescribing guidelines in order to provide an optimal quality of care for patients at the BRIDGE Healthcare Clinic. It would be beneficial to use the results of this study as a baseline of where the clinic is currently at in terms of adherence to guideline recommendations and have a pilot program implemented where pharmacy students, who have an educational background primarily in pharmacological therapeutics, would assess medication orders given by the medical team based on current practice guidelines in order to ensure they are being started on the most optimal treatment plan before being discharged with their order. If there are any discrepancies in prescribing patterns during these interventions, the pharmacy team can work to provide additional education to the interdisciplinary team in order to provide better insight on their recommendations to the team. Future studies in which these interventions by the pharmacy team are implemented are suggested to assess for improved adherence and outcomes.

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Disclosures

The authors have no conflicts of interest to disclose.

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