

Dual Hypertensive Medication Therapy for Initial Treatment of hypertension with BP greater than 140/90

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May 1, 2023

Abstract

Background and Local Problem: Hypertension is one of the leading causes of heart disease globally, nationally, and locally in El Paso, TX. An estimated 1.28 billion people are affected by this disease, including at least 30% of the El Paso population.

Objective: The objective of this project is to apply evidence-based practice to decrease blood pressure readings of 140/90 mmHg and above, by at least 10 mmHg systolic or diastolic.

Methods and Interventions: A ten-day reflective practice assessment was conducted resulting in the identification of suboptimal blood pressure control with blood pressure readings of 140/90 mmHg and above. This was done using a monotherapy anti-hypertensive agent such as Hydrochlorothiazide 12.5 mg–25 mg or Lisinopril 10 mg–20 mg, daily. A literature review was conducted to review the ability of evidence-based treatment to lower blood pressure readings $\geq 140/90$ mmHg by at least 10 mmHg systolic or diastolic, effectively, and safely. The use of dual or combination anti-hypertensive agents such as Lisinopril 10-40 mg and Amlodipine 2.5-10 mg, for blood pressures above 140/90 mmHg was shown to reduce systolic or diastolic blood pressure by at least 10 points, thereby achieving optimization in a timely manner.

Results: Three patients were treated with dual anti-hypertensive medications. All three had a decrease of >10 mmHg in either systolic or diastolic pressure.

Conclusion: The use of dual anti-hypertensive medication is effective in reducing blood pressure by at least 10 mmHg systolic or diastolic; hence, blood pressure control can be achieved in a timely manner.

Introduction

Problem Description

Hypertension is the leading cause of heart disease, coronary artery disease, cerebrovascular accidents, and chronic kidney disease in the United States. It is a global, national, and local health condition that affects 1.28 billion people, in which 46% are unaware of their hypertensive condition, and less than 23% are treated worldwide (World Health Organization, 2021). In the United States, 116 million (47%) of the adult population have hypertension with only 1 in 4 cases being controlled (Center for Disease Control and Prevention, 2022). Locally, according to the Healthy Paso Del Norte (2023), the prevalence of hypertension in El Paso, TX at age 18 years old and above is 30.2%. In the United States, it is estimated that hypertension and its associated co-morbidities incur an additional medical expense of \$2000 per patient, averaging about \$130 billion, annually (Kirkland, et. al, 2018).

In the primary care setting, early detection of an elevated blood pressure (BP) is key. Identifying those at risk for hypertension with BP readings of 140/90 mmHg and above on two separate occasions is crucial. Primary intervention strategies include healthy lifestyle modifications such as a diet low in sodium and fat, and at least 30 minutes of daily, moderate exercise. Patients who cannot achieve BP control with readings below 140/90 mmHg through primary interventions should be placed on a medication regimen for optimum regulation.

Available Knowledge

The American Heart Association (AHA) and American College of Cardiologist (ACC) have set criteria and guidelines for the classification and treatment of hypertension (2021). The stages of hypertension are as follows:

- 1) Normal blood pressure: <120 mmHg/<80 mmHg
- 2) Elevated blood pressure: 120 mmHg–129 mmHg/<80 mmHg
- 3) Stage 1 hypertension: 130 mmHg–139 mmHg/80–89 mmHg

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4) Stage 2 hypertension: ≥ 140 mmHg/ ≥ 90 mmHg

These guidelines have emphasized a lowered threshold for classifying stage 1 hypertension with readings of 130–139 mmHg systolic and 80–89 mmHg diastolic—a ten-point drop from the previous limit at 140/90 mmHg (Wheaton et. al, 2017). For BP readings $>130/80$ mmHg, treatment recommendations include initial lifestyle modifications with the addition of a single anti-hypertension agent if it remains uncontrolled after three months. The recommendation for stage 2 hypertension is the use of a single or combined anti-hypertensive agent(s). Similar guidelines were published by the Joint National Committee, version 8 (JNC 8) (American Family Physicians, 2014), however classification categories differ.

Although numerous guidelines are available worldwide and nationwide for practitioners to use in the treatment of hypertension, only 43% of those were prescribed a dual therapy for initial treatment. The use of the step approach method in monotherapy with subsequent titrations continues to be the most common initial treatment for hypertension (An et. al, 2021).

Rationale

A ten-day reflective practice assessment was conducted in the fall of 2022 at CNA Adult Primary Care and Pediatrics Clinic, which also served as an urgent after-hour care facility. Upon completion of the ten-day reflective practice assessment, a review of patients utilizing the Electronic Health Records (EHR) system, revealed that a total of 93 patients were seen, of which 14 had been evaluated for uncontrolled BP with readings above 140 mmHg systolic or 90 mmHg diastolic. Some patients were placed on one or more anti-hypertensive medications, mainly Hydrochlorothiazide 12.5 mg–25 or Lisinopril 10 mg–20 mg, resulting in a minimum average of 7 mmHg decrease in one or both (systolic and/or diastolic) readings from the baseline blood pressure. Data collected showed that some patients experienced uncontrolled BP readings for more than six months, even after up-titration with single anti-hypertensive medications.

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It was evident that aggressive measures to optimize BP in a timely manner were not practiced and therefore, a controlled blood pressure was not achieved. The question became, “Is there a more effective initial approach to controlling high blood pressure?”

A review of all available guidelines was conducted to include the ACC, AHA, and JNC 8. All three recommended the use of a single OR combination anti-hypertensive agents for blood pressure readings $\geq 140/90$ mmHg, at the provider’s discretion. However, the European Society of Cardiology published recommendations involving the use of a step care approach, by simultaneously initiating two different anti-hypertensive agents to increase the effective and timely control of hypertension (European Heart Journal, 2018).

A literature review was then conducted through search engines such as Cochrane review, PubMed, CINAHL, OVID full text, and Google Scholar, using key words/phrases such as “initial hypertension treatment,” “medication for primary hypertension,” “gold standard for hypertension treatment,” and “uncontrolled hypertension.”

The three articles with the most evidence were used to gather evidence-based practices to answer the question above. The first article was a level 1 systematic review and meta-analysis of randomized control trials (RCT) available on Medline, Embase, and Central, until August 2017. A total of 33 RCTs were reviewed with the conclusion that dual anti-hypertensive medication is superior to a single agent in reducing BP by up to 9.5 mmHg (Salam et al., 2019). The second article, a level 3 RCT meta-analysis double blind study with a population of 5,888 subjects, compared the use of Olmesartan as a solo agent versus as a combination agent. An average reduction of 22.7 and 15 mmHg, systolic and diastolic, respectively was recorded with the use of dual anti-hypertensive agents (Deedwania et al., 2019). The last article, a level 4, investigated the increased use of dual anti-hypertensive agents for newly diagnosed patients with hypertension. It investigated a total of 161,585 subjects from 2002–2007 and noted an increase of 15% in the use of said agents.

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A PICOT format was then developed to aid in the implementation of the quality improvement project proposal based on the literature review. The PICOT format was as follows:

- P** – Patient: 18–64 years old, with primary hypertension (BP \geq 140/90 mmHg), uncontrolled with BP sustained $>$ 140/90 mmHg
- I** – Intervention: Literature Review recommendation; start on Lisonorm 40/5 mg PO, once daily (Lisinopril 40 mg and Amlodipine 2.5 mg, single pill, or individual agents)
- C** – Current: Start on Hydrochlorothiazide 12.5 mg, once daily
- O** – Outcome: Controlled blood pressure $<$ 140/90 mmHg on home BP log
- T** – Time: 2 weeks

The RE-AIM (Reach, Effectiveness, Adoption, Implementation and Maintenance) translation framework was chosen to apply evidence-based techniques to clinical practice, to improve patient outcomes by reducing blood readings \geq 140/90 mmHg by 10 mmHg, systolic or diastolic. According to Holthorp et al. (2021), RE-AIM focuses on evaluation versus planning versus improvement, an approach that is comparable to the nursing process. The components of RE-AIM are as follows: Reach, Effectiveness, Adoption, Implementation and Maintenance. Using this framework in the implementation of the project allowed for the following to be achieved:

- 1) Reach – Identification of patients with blood pressure readings \geq 140/ \geq 90 mmHg
- 2) Effectiveness – Based on the literature review, dual anti-hypertensive medications have been shown to be superior to single agent medications for BP reduction.
- 3) Adoption – Education of other nursing or medical providers on the findings; education of medical assistants on historical data collection.
- 4) Implementation – Treating patients with dual anti-hypertensive medication.
- 5) Maintenance – Continuing frequent follow-ups to ensure that the treatment is effective.

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Figure 1: The RE-AIM translation framework

The quality improvement model used to drive this project is Lewin's model of change. Although originally developed for managerial projects, it was easily applicable in driving a change in hypertension management with evidence-based practices. The three components of this model are: 1) Unfreeze – Based on the literature review, the effectiveness of dual anti-hypertensive medications is superior to single agent medications for the treatment of hypertension; 2) Move – Implementation of the findings with an improved outcome of readings $\geq 140/90$ mmHg, adopting evidence-based practices into clinical practice 3) Refreeze – Adopting evidence-based practices as a guideline for patients with hypertension (Burns, 2020).



Figure 2: Lewin's Change Management Model

Specific Aims

The purpose of this project is to improve the effective control of hypertension by reducing BP measurements ≥ 140 mmHg/ ≥ 90 mmHg by at least 10 mmHg via the use of dual anti-hypertensive medication as an initial treatment in adults aged 18–64 years old. Optimum BP control will reduce the risk of cardiovascular disease, cerebral vascular accidents, chronic disease, and other comorbidities.

Methods

Setting

The patient population was observed at the CNA Adult Primary Care and Pediatrics Clinic in El Paso, TX. The clinic is also an urgent care facility.

Intervention

The intervention included a dual therapy prescription of Amlodipine 2.5–10 mg and Lisinopril 5–20 mg for two consecutive blood pressure readings of $\geq 140/90$ mmHg, to reduce BP by at least 10 mmHg systolic or diastolic.

The quality improvement project proposal was approved by my worksite supervisor/ collaborating physician and DNP chair (College of Nursing-University of Texas at El Paso) as well as the university's Institutional Review Board (IRB). Permission to commence the project was granted upon the approval of the IRB, work site letter, and project proposal. Project implementation began on January 17, 2023.

Day 1: Project started:

- 1) The staff were educated as follows:
 - a. Medical Assistants:

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- i. If the patient meets the criteria, identify one prior BP reading greater than 140/90 mmHg via the EHR.
 - ii. If the BP is $\geq 140/90$ mmHg, allow the patient to rest for 15 minutes and retake the BP.
- b. Administrative Staff:
- i. Follow up appointments: initial - x1 week, subsequent - x2 weeks for patients who agreed and were placed on intervention.
- c. Patients were seen, assessed, and interventions with follow-up appointments were made.

Day 2–20:

- 2) Patients were seen, assessed, and interventions with follow-up appointments were made.

The project was completed on day 20 (February 15, 2023) with a total of 160 clinical hours.

Method of evaluation

Patients who met the criteria with one or more previous BP readings of $\geq 140/90$ mmHg were placed on dual anti-hypertensive medications: Lisinopril 10 mg and Amlodipine 2.5–10 mg. Patients were instructed to take their BP readings before taking the medication, and to withhold the medication if the readings were $< 120/80$ mmHg. A follow-up was scheduled within three days to one week of starting the medication, in which an in-office reading was taken and the home BP log was discussed. If the home BP readings varied > 10 mmHg from the in-office reading, a return demonstration on taking the BP measurements was conducted with the patient to ensure consistency in the readings. A second follow-up within two weeks of starting the medication was then scheduled.

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At the end of the four weeks, patients who met the criteria were reassessed with a final BP measurement for the quality improvement project.

Measures

Patients who met the criteria were screened to ensure an additional reading in the EHR and lifestyle modifications were discussed with them. Medication side effects were extensively discussed with patients, along with an emphasis on close BP monitoring.

A historical review of blood pressure readings was conducted on the day of visit. Upon identification of two blood pressure readings $\geq 140/90$ mmHg, with patients' consent, they were placed on Lisinopril 10 mg and Amlodipine 2.5–10 mg. An in-house meeting was conducted one week later, with subsequent visits in two-week intervals. All data collected were recorded in the EHR system.

Analysis

Four patients met the criteria and agreed on the intervention: one Hispanic female, two Hispanic males, and one African American male, ages 59–63 years old. Of the four patients, only three returned for follow-up visits. The patient who did not return for their follow-up, did not start the medication due to them working out of town within a time frame beyond the timeline allowed for this project.

Ethical Considerations

No video or audio recordings of the patients were conducted. All data were recorded through the office's EHR (e-Clinical Works).

Results

Outcomes

Patient 1: A 63-year-old African American male with newly diagnosed Diabetes Mellitus type II and two BP readings of 150/75 mmHg and 165/89 mmHg was started on Lisinopril 10 mg and

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Amlodipine 5 mg for BP control. Due to the patient's non-compliance with medication adherence, a three-day follow-up was scheduled. An in-office BP reading of 139/84 mmHg, review of home BP log ranges from 138–142 mmHg systolic and 74–82 mmHg diastolic.

Patient 2: A 55-year-old Hispanic male with no significant medical history, presented for acute back pain which was then treated. The patient had an elevated BP of 178/98 mmHg. The EKG was negative, and shortness of breath or chest pain was denied. The patient was treated in-house with medication (Nifedipine 10 mg). A close follow-up two days later revealed that the back pain was resolved, though the BP continued to be elevated at 171/91 mmHg. The patient was asymptomatic, treated in-house with Nifedipine 10 mg, and was prescribed Lisinopril 10 mg and Amlodipine 2.5 mg. A follow-up one week later showed a BP with a systolic range of 138–142 mmHg and diastolic of 88–92 mmHg with an in-house reading of 138/88 mmHg.

Patient 3: A 53-year-old Hispanic female with several previous BP readings of 150/88 and 154/85 mmHg, asymptomatic with no chest pain, shortness of breath, or syncope. The patient agreed to medical intervention and was started on Lisinopril 5 mg and Amlodipine 2.5 mg. A one-week follow-up was conducted, and the in-house BP reading was 138/88 mmHg. A review of the home BP log revealed systolic and diastolic ranges of 134–138 and 84–88 mmHg, respectively. There was an outlier of 149/88 mmHg.

Discussion

Summary

The project was completed on time within the span of four weeks on February 15, 2023. All three patients achieved a BP reduction greater than 10 mmHg in systolic or diastolic readings after initial treatment with Lisinopril 5–10 mg and Amlodipine 2.5–5 mg. An average reduction amongst the three patients was 19 mmHg systolic and no significant reduction in the diastolic readings was noted.

Interpretation

The quality improvement project focused on the effective and timely control of blood pressures $\geq 140/90$ mmHg using dual anti-hypertensive medications as the initial treatment to reduce SBP or DBP by 10 mmHg. In comparison to the study by Deedwania et al., (2019), similar results were yielded for systolic blood pressure reduction. Optimum management of hypertension allows for 1) Controlled BP with readings $< 140/90$ mmHg; 2) Less patient visits, allowing for new patients to be scheduled; 3) Reduced health care costs; and 4) Improved patient outcomes.

Limitations

The patient population investigated were within the ages of 18-65 years old. As the project was conducted during the winter months, patients were mostly seen for urgent care visits. Another limitation is that some patients with hypertension were already on treatment at the time of this project.

Conclusion

Uncontrolled hypertension is prevalent globally, nationally, and locally. Effectively achieving optimum BP control in a timely manner will reduce multiple comorbidities such as cardiovascular disease, cerebral vascular accidents, chronic kidney disease, and vascular disease.

The implications of well-controlled hypertension for the patient equates to fewer visits to the clinic, a cost reduction due to less visits, an increase in quality of life, and most importantly, a reduction in the risk of developing cardiovascular, kidney, and cerebral vascular diseases. The implications for the clinic include an improved patient outcome, more time slots for new patients and less emergency room visits.

Funding

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There were no conflicts of interest associated with this project. However, the Paso del Norte Health Foundation Graduate Fellows Program awarded a grant of \$3000 in support of this project.

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