



# Evaluating Hypertension Management at a Student Run Free Clinic in Alabama

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## Abstract

**Background:** Healthcare remains unavailable for many persons who are un- or under-insured. Equal Access Birmingham (EAB) is a student run free clinic that provides urgent, primary, and specialty care to the Birmingham area. The purpose of this study was to evaluate EAB's effectiveness in hypertension management.

**Methods:** A total of 137 patient records were identified with hypertension. After exclusion criteria were applied, the cohort consisted of 66 patients. The average number of clinic visits per patient was 6.4 (standard deviation [SD]  $\pm$  4.1).

**Results:** Systolic blood pressure decreased from 151.3mmHg to 140.6mmHg ( $p=0.0028$ ,  $t(64)=2.95$ , 95% confidence interval [CI] 3.82, 17.57). Diastolic blood pressure decreased from 90.7mmHg to 85.5mmHg ( $p=0.0120$ ,  $t(64)=2.37$ , 95% CI 1.18, 9.27).

**Conclusions:** In patients with consistently recorded vital signs that followed up with regular clinic visits, blood pressure over time was significantly reduced. However, many patients were lost to follow up.

## Introduction

As healthcare costs continue to rise nationwide, the role of free community clinics in treating the underserved and underinsured has become more apparent. This is especially true of student run free clinics (SRFCs), or clinics run by medical and pharmacy students to promote access to care in vulnerable populations.<sup>1,2</sup> Utilizing volunteer physicians, SRFCs pose a humanitarian outlet for providing accessible and affordable primary care to individuals who would often have to go without due to cost, transportation barriers, or lack of insurance.<sup>2</sup> Serving as a welcome addition to the healthcare safety net, these clinics aid in providing preventative medicine and ambulatory care to the underserved in areas such as hypertension, diabetes, Pap smears, and vaccinations.<sup>3,4</sup>

Nearly three-fourths of medical students reported participation in SRFCs during their

training by 2017, aiding in medical care for an estimated 10 million underserved Americans nationwide.<sup>5,6</sup> These clinics have proven not only to benefit medical education in terms of clinical skills, but also in areas of student autonomy, clinical decision making, exposure to diverse patient populations, and social accountability.<sup>2,6,7</sup> Further outlined by Sheu et. al, SRFCs serve as a vital source of medical education during preclinical years, posing a unique opportunity in educating medical students about healthcare systems at large.<sup>8</sup> This notion is further described by the definition of systems-based practices, or the ability of a clinician to "demonstrate an awareness of and responsiveness to the larger context and system of health care," whether it be through navigating a patient's lack of insurance, cost of medications, or need for social work services.<sup>7</sup>

While studies have outlined the benefit of SRFCs in medical student education and clinical skills competency, there has been a recent push

to consider the effects of these clinics outside of their teaching potential. One major factor for consideration is the direct effect of these clinics on patient outcomes--specifically within the realm of preventative health services.<sup>3,4,9</sup> By offering services such as disease counseling, immunizations, and health screenings, preventative medicine improves overall population health by protecting against disease and lessening chronic disease impact.<sup>10</sup> While improvements in chronic conditions and health outcomes are often assumed within patients of SRFCs, few studies have been conducted in order to assess quality of patient care and long term clinical outcomes.

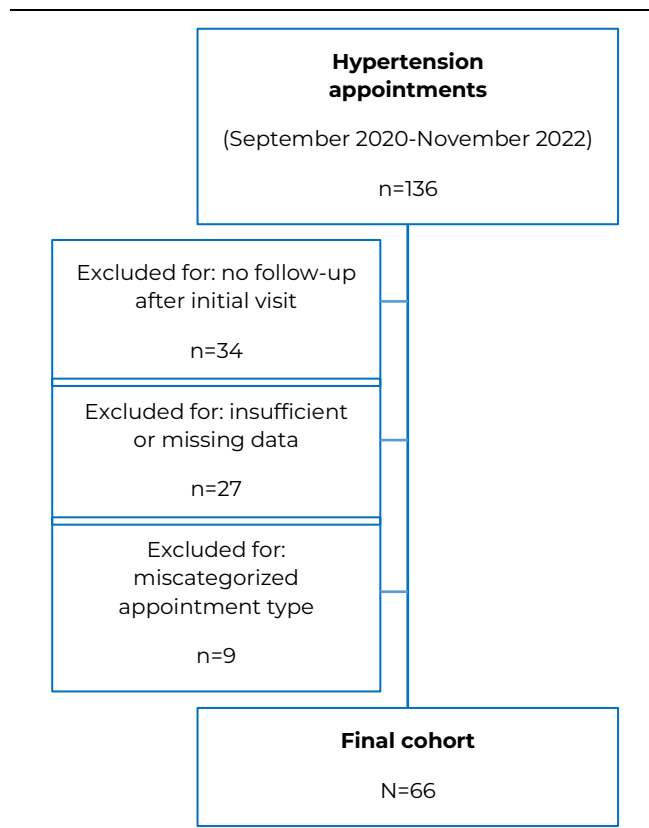
Equal Access Birmingham (EAB) is a SRFC in Alabama. Operating every Sunday and Wednesday, EAB provides continuity of care to its 300+ annual patients through both ambulatory and chronic care clinics. In addition to bi-weekly scheduled clinics, EAB houses biannual specialty clinics, including Reproductive Health Screenings and optometry assessments. These services, alongside medication refills and social work referrals, come at no cost to the patient.

The aim of this study is to evaluate EAB's effectiveness in hypertension management. Affecting every third adult worldwide, hypertension is a leading cause for chronic prescription medication use.<sup>11</sup> Hypertension can lead to complications such as left ventricular hypertrophy, heart failure, ischemic stroke, intracerebral hemorrhage, ischemic heart disease, and chronic kidney disease.<sup>12,13,14</sup> In this study, we compared patient blood pressure readings at the time of entry into care to the last blood pressure measured during the study period in order to determine the effectiveness of hypertension care at EAB.

### Methods

A single-institution retrospective review was conducted of all patients seen for management of primary hypertension at EAB from September 2020 to November 2022. EAB is overseen by the University of Alabama at Birmingham Heersink School of Medicine, a tertiary referral hospital and academic medical center, and Institutional Review Board (IRB) approval was obtained prior to the initiation of this study's protocol. EAB's electronic medical record (EMR) system, Cerner

**Figure 1.** Patient selection, inclusion, and exclusion criteria



Millennium® (2023, Oracle Cerner Kansas City MO), was utilized to identify all patients who presented to clinic within the given time period, and patients who had an appointment type categorized as “New Patient” or “Hypertension” were identified. For appointments categorized as hypertension, both new and return patients were included. New patient appointments were assessed to include those who received a diagnosis of hypertension. All patient records were then reviewed, and variables collected for each patient included age, sex, date of initial clinic visit, date of most recent clinic visit, total number of clinic visits during the study period, and continued engagement in care or loss to follow up. Each patient’s blood pressure measurements were recorded for each visit throughout the specified time period. Patients were excluded if they had less than two clinic visits in total or had less than two recorded blood pressure measurements during the study period. Descriptive statistics were used to summarize the above variables for the cohort, and a paired t-test was utilized to identify differences between mean blood pressure

**Table 1.** Summary of patient demographics and clinical characteristics

Variable	Value
Age, mean years $\pm$ SD	48.8 $\pm$ 13.9
Sex – Male, n (%)	39 (59.0)
Presenting systolic blood pressure, mean mmHg $\pm$ SD	151.3 $\pm$ 31.6
Presenting diastolic blood pressure	90.7 $\pm$ 17.0
Number of clinic visits, mean days $\pm$ SD	6.4 $\pm$ 4.1
Lost to follow-up, n (%)	18 (27.3)

SD: standard deviation.

readings recorded on the first clinic appointment versus the most recent clinic appointment. These univariate and bivariate analyses were performed using Microsoft Excel (v16.57, Microsoft, Redmond, WA).

## Results

Upon initial query of the EMR database, a total of 137 patient records were found according to the inclusion criteria (Figure 1). Of these, 72 patients met exclusion criteria. Specifically, 30 patients were only seen for their initial clinic appointment and were subsequently lost to follow up. There were 42 patients excluded due to insufficient data for various reasons including miscategorized appointment type and inconsistent or absent blood pressure recordings. The final cohort consisted of 66 patients. The mean age of the cohort was 48.8 years (standard deviation [SD]  $\pm$  13.9), and 39 patients (59.0%) were male (Table 1). The average number of clinic visits per patient was 6.4 (SD  $\pm$  4.1) during the study period. The average time each patient spent under the care of the clinic, as measured by the difference between first and last appointment dates, was 333 days (SD  $\pm$  240 days; range 875 days). On initial clinic evaluation, the mean systolic blood pressure recording for the cohort was 151.3mmHg (SD  $\pm$  31.6mmHg) with a corresponding mean diastolic pressure of 90.7mmHg (SD  $\pm$  17.0mmHg) (Table 2). For the cohort, both the mean systolic and diastolic blood pressures were reduced at the time of the most recent clinic visit compared to blood pressure measured at their initial visit. Systolic blood pressure decreased from 151.3mmHg to 140.6mmHg ( $p=0.0028$ ,  $t(64)=2.95$ ,

95% confidence interval [CI] 3.82, 17.57). The reduction in diastolic blood pressure decreased from 90.7mmHg to 85.5mmHg ( $p=0.0120$ ,  $t(64)=2.37$ , 95% CI 1.18, 9.27). Out of the 66 patients who met inclusion criteria, 18 patients (27.3%) were considered lost to follow up, defined as a 1-year period since their last clinic visit at the study's end date.

## Discussion

Over 42% of Alabamians report hypertension and suffer some of the highest rates of cardiovascular disease and stroke nationwide.<sup>12,15</sup> According to the United States (US) Census, in 2022 an estimated 16.1% of the state's population was living in poverty and 11.8% of the population under the age of 65 was uninsured.<sup>13</sup> The prevalence of hypertension (HTN) complicated by poverty and lack of access to care contribute to worsened HTN-related health outcomes in the state.<sup>14</sup> EAB, an SRFC located in Birmingham, Alabama and providing care to the under- and un-insured, is a part of the solution to addressing HTN and other health needs in Alabama. The clinic is staffed by medical student, pharmacy student, physician and pharmacist volunteers. Clinic volunteers have varied levels of experience managing hypertension and patients engaged in continuous care at EAB often see a different healthcare team at each visit. In this study we compared blood pressure (BP) at time of entry into care to last BP measured during the study period in persons with hypertension to determine effectiveness of hypertension management at EAB. We observed that patients undergoing treatment for hypertension experienced a significant reduction in both systolic BP (SBP) and diastolic BP (DPB) between their first and final visit during the study period. This level of reduction in blood pressure has been shown to be of clinical importance. In a large meta-analysis of 147 randomized trials evaluating hypertension management and health outcomes, achieving blood pressure reductions of at least 10mmHg systolic and 5mmHg diastolic reduced adverse cardiac events by approximately 25% and stroke risk by approximately 33%.<sup>16</sup> EAB patients who remained in care on average experienced an SBP decrease of 10.7mmHg with a concurrent DBP decrease of

**Table 2.** Longitudinal differences in systolic and diastolic blood pressures

Blood pressure	First visit, mmHg $\pm$ SD	Last visit, mmHg $\pm$ SD	Difference, mmHg $\pm$ SD	95% CI	p-value
Systolic	151.3 $\pm$ 31.6	140.6 $\pm$ 17.7	10.7 $\pm$ 28.0	3.82, 17.57	0.0028
Diastolic	90.7 $\pm$ 17.0	85.5 $\pm$ 10.9	5.2 $\pm$ 16.5	1.18, 9.27	0.0120

SD: standard deviation; CI: confidence interval.

5.2mmHg. If these comparable reductions in blood pressure can be sustained through regular follow-up through EAB's SRFC, similar reductions in adverse cardiac events and stroke can reasonably be expected in this patient population. This suggests that despite diversity in experience of healthcare teams in hypertension management and variation in the composition of the healthcare team at each visit, the SRFC model can be effective in hypertension management in underserved populations in a resource limited setting in persons who are able to follow up in clinic.

The EAB clinic's pharmacy primarily has access to common first-line agents used in the treatment of high blood pressure, namely hydrochlorothiazide, amlodipine, lisinopril, and losartan. EAB physician volunteers typically begin with a single antihypertensive agent and titrate to effectiveness pending patient follow-up and individual needs. Typical practice for EAB is titrating one agent to the maximum recommended dose before the addition of a second agent. In addition to pharmacological therapy, education about diet, weight loss, and smoking cessation are consistently provided at each clinic visit. Further studies are needed to elucidate patient compliance with lifestyle recommendations in addition to consistency of patient follow-up.

Despite successes in hypertension management at EAB, a large proportion of patients with hypertension diagnosed at initial visit did not return for follow up. Further, a large proportion of patients with a diagnosis of HTN were excluded from the study because they only presented to clinic once. Many people face barriers to healthcare including lack of transportation, social pressures, and low health literacy. One study conducted in 2012 found that 18% of US adults experienced financial barriers to healthcare, and of that 18%, two-thirds experienced non-financial barriers in addition to financial barriers. Some of the common barriers to healthcare experienced

in underserved populations in the US include distance to care, lack of transportation, difficulty leaving work, inconvenient appointment times, clinics not accepting their insurance, and time before appointment availability.<sup>17</sup> Together these factors reduced access to care.

A cross-sectional study conducted by Kami-mura et al in 2018 demonstrated that effective primary care in uninsured populations may fall short of the goal if the clinic focuses on medical intervention alone. Kamimura et al argue that strong social programs must be in place in addition to free, effective medical care to ensure that patients can overcome the previously examined barriers to healthcare.<sup>18</sup> While EAB's SRFC attempts to overcome barriers faced by vulnerable populations by providing medical care (primary care, psychiatric care, women's health, dermatology, and physical therapy), laboratory services, and same-day medication refills on-site at no cost to the patient, it's lack of comprehensive social services and inability to support patient transportation may impact loss to follow up.

This study has several limitations. Of the 137 patients seen at the clinic over the study period, only 48% had recorded blood pressure readings from each visit. This is likely the result of clinic's recent switch to electronic medical record and its temporary transition to virtual visits during the coronavirus disease 2019 (COVID-19) pandemic. In addition, the clinic saw a fall in its number of patients during the COVID-19 pandemic impacting size of the study population. Furthermore, this study focused solely on BP and did not evaluate patient-level variables such as sex and age associated with differences in systolic and diastolic blood pressure reduction.

Despite these limitations, the study suggests that no-cost SRFCs can be effective at treating hypertension in underserved populations. Future studies will focus on addressing barriers to adherence with follow-up appointments and on ways to improve data collection and tracking at free

clinics like EAB's SRFC. Overall, this study indicates that no-cost SRFCs can be effective at significantly reducing elevated blood pressures in at-risk populations.

### Disclosures

The authors have no conflicts of interest to disclose.

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