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RESEARCH ARTICLE

Reaching the Hard-to-Reach: Outcomes of the Severe Hypertension Outreach Intervention

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Introduction: Severe hypertension (≥180 mmHg systolic or ≥110 mmHg diastolic) is associated with a twofold increase in the relative risk of death. At the authors' Federally Qualified Health Center in the Southeast, 39% of adults (*n*=8,695) had hypertension, and 3% (*n*=235) were severe. The purpose of this project was to lower blood pressure and improve the proportion of patients achieving the Agency for Healthcare Research and Quality goal for blood pressure.

Methods: This quality improvement project was performed in 2017 in three 3-month Plan, Do, Study, Act cycles using a multidisciplinary outreach model in a community-based primary care setting. A clinical team including physicians, nurses, patient navigators, behavioral health counselors, and pharmacists contacted adult patients with severe hypertension (≥180/110 mmHg), scheduled visits, and established blood pressure and medication management goals. The data review and analysis concluded in 2019.

Results: Among patients with blood pressure ≥180/110 mmHg (*n*=235), the average age was 57 years (SD=12 years), 37% (*n*=87) were male, 82% (*n*=193) were Black, and 46% (*n*=108) were uninsured. The majority of those contacted attended a follow-up appointment within the 9-month project (77%, *n*=181) and achieved an improved systolic blood pressure (87%, *n*=167) and diastolic blood pressure (76%, *n*=146). Target blood pressure of <140/90 mmHg was achieved in 29% of patients (*n*=53). Medication possession ratio improved from 23% to 40% among patients reached by pharmacists (*n*=30). Fewer deaths occurred in those reached by the intervention than in those not reached (*n*=1 vs *n*=3).

Conclusions: Multidisciplinary outreach and use of evidence-based guidelines (Eighth Joint National Committee) were associated with lower blood pressure in patients with severe hypertension.

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INTRODUCTION

Hypertension is a widespread chronic condition and a primary risk factor for heart disease, stroke, and premature death.[1] The prevalence of hypertension has risen in the past decade, currently affecting 77.9 million Americans or 1 in 3 adults (28% in White, non-Hispanics; 26% in Hispanics; 41% Black, non-Hispanics).[1,2] Rates of controlled blood pressure (BP), defined as systolic <140 mmHg and diastolic <90 mmHg at the time of this study,[3–5] are notably worse in minority groups, with only 49% Black, non-Hispanics and 47% Hispanics/Latinos in control compared with 56% White, non-Hispanics.[6] These data indicate a need for population-specific quality improvement (QI) interventions focused on minority populations.[3]

To improve the quality of care for underserved populations, Federally Qualified Health Centers (FQHCs) are designed to provide accessible, high-quality primary care, regardless of the patient's ability to pay, by offering a discounted fee schedule to those with documented low income.[7] These centers are strategically located in medically underserved communities and serve more than 27 million patients. A total of 1 in 12 Americans relies on an FQHC for preventive and primary healthcare needs, and 62% of the population served are from a racial or ethnic minority group.[4] Quality metrics are assessed annually at FQHCs and reported through the Uniform Data System to the Health Resources and Services Administration.[8] One reported measure of health outcomes and disparities is the percentage of patients aged 18–85 years with a diagnosis of controlled hypertension, which is categorized by race and ethnicity and considers <140/90 mmHg controlled.[5,8] Of the total hypertensive population served at an FQHC in the U.S. in 2016 (N=3,920,129), only 62% were controlled.[9] When categorized by race, disparities in rates of controlled hypertension in FQHC patients persist: only 56% of Black, non-Hispanics were controlled compared with 65% of Hispanics/Latinos and 65% of White, non-Hispanics.[9]

The risk of stroke and death increase incrementally with BP, with the risk doubling for every 20 mmHg over 115 mmHg systolic,[10–12] and thus far, interventions to control systolic BP have failed to achieve a sustained effect.[13] Interventions to improve the control of hypertension have been tested for more than a century and include a broad range of approaches from simple paper-based education[14] to complex, technology-based continuous home monitoring with direct, digital feedback to both patient and provider.[15] Despite the success of many of these in the context of clinical trials, none have resulted in a sustainable change at the population level, especially in high-risk groups.

Guidelines from the American College of Preventive Medicine (ACPM), Joint National Committee, American College of Cardiology, and the American Heart Association recommend team-based interventions to improve quality of care for resource-constrained populations.[4] Recommendations include partnering with pharmacists, nurses, community health workers (CHWs), and others; yet, published reports of sustained effects are few.

The purpose of this QI initiative is to improve the rate of BP control in patients served by the authors' FQHC with severe hypertension through the implementation of a Severe Hypertension Outreach initiative using a team-based multidisciplinary approach.

METHODS

This study used a prospective, pre–post cohort design and an iterative QI Plan, Do, Study, Act (PDSA) approach.[16] The objective was to contact patients with severe hypertension documented at their last visit and re-engage these patients in care, with the goal of medication optimization and BP reduction. The outreach intervention occurred over three 3-month PDSA cycles from January 2017 to November 2017 (Figure 1). Data review and analysis concluded in 2019.

Study Sample

In 2017, an urban FQHC in the Southeast served >33,500 patients across 10 clinical sites.[17] Almost half (47%) reported a first language other than English and many (50% of adults and 24% of children) were uninsured. Income level of those served was <100% of the Federal Poverty Level for 38% of households served and >200% of the Federal Poverty Level for 19% of households served. Some patients (31%) did not provide income documentation.[17] Among patients aged 18–85 years served in 2017, a total of 38.6% (n=8,695) had a diagnosis of hypertension, and the rate of controlled hypertension was only 56% for Black, non-Hispanic patients compared with 63% for Hispanics/Latinos and 62% for White, non-Hispanics.

Measures

A team that included physicians, pharmacists, behavioral health professionals, care coordinators, a patient navigator, and student volunteers was assembled for this study. It targeted patients at the highest risk, establishing a baseline cohort of patients with last systolic BP≥180 mmHg or diastolic BP≥110 mmHg in a report generated by the Epic© electronic health record and formatted for the Uniform Data System. Additional inclusion criteria were age ≥18 years and having a visit at one of the locations in the past 12 months. The cohort (n=235) was verified by manual chart review by 2 authors (HB and TH).

A patient navigator in the department of care coordination was designated to attempt to re-engage patients in care. The navigator had 4 specific roles: conducting phone calls, scheduling appointments, arranging transportation, and identifying patients for financial counseling. All patients (n=235) were called by the navigator, and approximately two thirds were reached on the initial call. For the remainder of patients, calls were attempted 3 times,

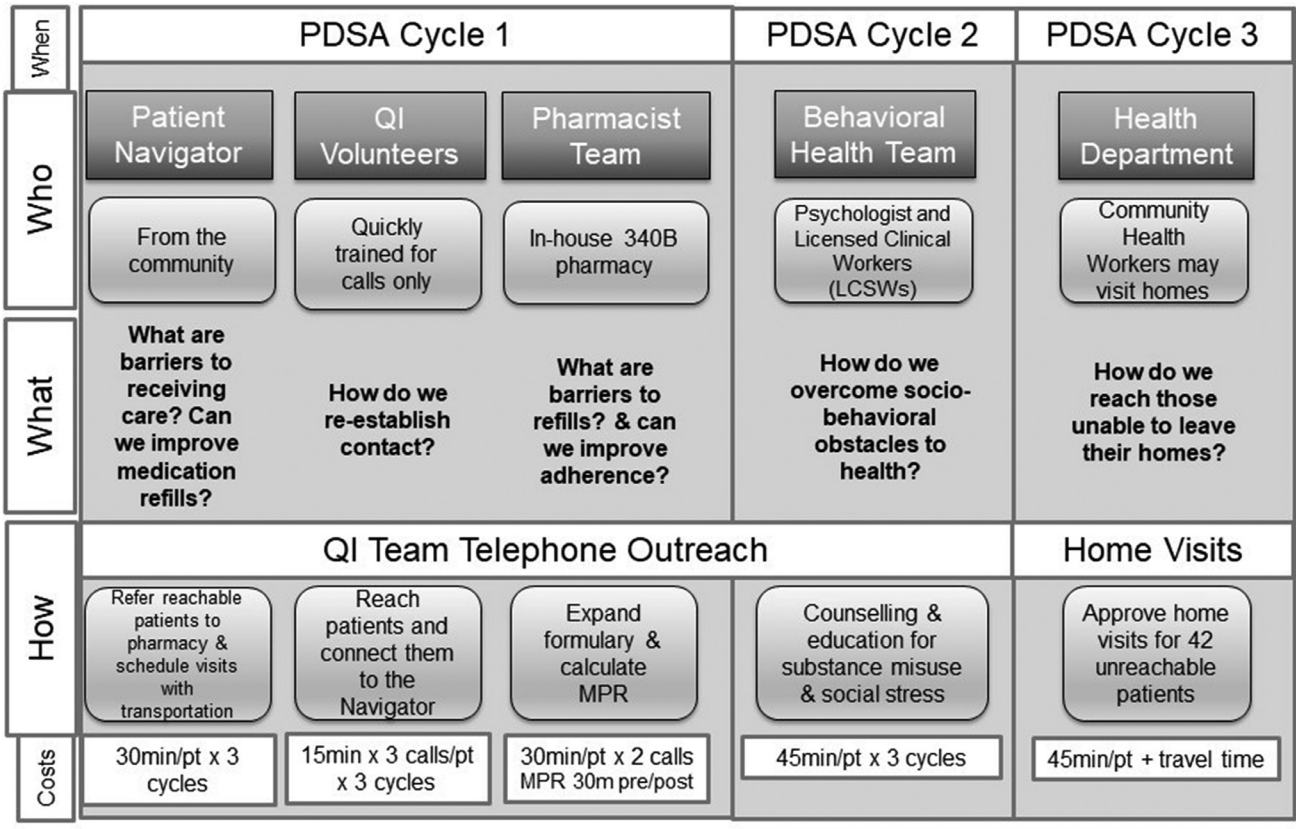

Figure 1. Methods and procedures according to PDSA cycles.

Note: All costs are calculated in average minutes per pt. Hourly rates for Navigators ($15), Pharmacists ($42), Psychologists ($40), LCSWs ($26), and CHWs ($15) are based on publicly available, average national rates in the Southeast and do not reflect indirect benefits or years of service.

CHW, community health worker; LCSW, licensed clinical social worker; MPR, medication possession ratio; PDSA, Plan, Do, Study, Act; pt, patient; QI, quality improvement.

and if the patient was not reached, a letter was sent inviting the patient to make an appointment. Pharmacy team members worked with physicians to add multiple strengths of a combined formulation of an antihypertensive medication (lisinopril/hydrochlorothiazide) to the formulary to lower pill burden and help providers follow the FQHC's hypertension treatment algorithm (Appendix Figure 1, available online). Pharmacy also began allowing a 90-day supply of all antihypertensives. Calculation of medication possession ratios (MPRs) for the patients who were filling medications at the in-house pharmacy was performed. The QI team used the SIMPLE (Simplify the regimen, Impart knowledge, Modify patient beliefs and human behavior, Provide communication and trust, Leave the bias, Evaluate adherence) medication adherence principles set forth by the ACPM[18–20] and endorsed by the Million Hearts Campaign[21] to question patients' remiss in refilling medications (Table 1).[22] These strategies were designed to improve medication access and communication on medication-taking behaviors beyond simply MPR.[23] Responses were reviewed throughout the cycle by the interdisciplinary team.

The team reminded providers to use the hypertension treatment algorithm (Appendix Figure 1, available online) and reinforced recommendations to consider (1) referring uninsured patients with financial hardship to a patient assistance program or for vouchers when available from the Department of Social Services to subsidize medications, (2) encouraging uninsured patients who do not use the 340B pharmacy to compare their costs with sliding scale prices, (3) allowing PRN (pro re nata, "as needed") refills on 90-day supplies of chronic medications to allow patients the flexibility to pick up 30- or 90-day supplies as financially feasible, and (4) scheduling a free nurse BP check for any patient unable to pay the copay for a provider visit.

At the conclusion of Cycle 1, the team reviewed barriers and facilitators to re-engaging patients in care. Barriers to call completion included the length of the phone call script and the number of patients using pay-by-minute cell phone service. Barriers to medication refills included lack of home delivery and lack of referral to behavioral health team members who were key to improving medication access by helping uninsured patients complete applications for patient assistance programs or obtain vouchers from the Department of Social Services to subsidize medications and by educating patients about addiction recovery resources when the patient was receptive.

In Cycle 2, the QI team continued the existing procedures with modifications to calls and clinic interactions to more effectively address the issues identified in Cycle 1. The team accessed transportation by scheduling patients for appointments with

Table 1. ACPM Medication Adherence Follow-up Questions

Follow-up questions to assess medication self-management[21,22]
What have you been doing since our last visit to control your blood pressure?
Do you have any fears about high blood pressure?
What do you think would make it easier to control your high blood pressure?
In the last 6 months, has it been hard for you to afford any of your medications?
Would getting a 90-day supply of medications instead of a 30-day supply be helpful in staying on track with your blood pressure medications?
Do you have any fear about the medications you were given to lower your blood pressure?
Does it take more than 2 trips a month to the pharmacy to get all your medicines filled?
Do you use personal or public transportation to come to LCHC?

ACPM, American College of Preventive Medicine; LCHC, Lincoln Community Health Center.

nurses and the patient navigator in order to access van rides (van rides are only available to patients with a scheduled appointment). The team worked with the Financial Aid Department to help patients apply for reduced/sliding scale fees for medications, and improved written materials to account for disparities in health literacy. These factors were observed to play a dominant role in many patients' inabilities to adhere to their recommended medical and lifestyle regimens. Homelessness, family stress, and substance abuse (predominantly alcohol and cocaine) were previously underappreciated contributing factors to severe hypertension. A behavioral health team comprising a psychologist and licensed clinical workers facilitated planning sessions to address these issues. Approximately one fourth of the cohort was referred for behavioral health services. The team also formed partnerships with the local university nursing school and obtained funding for further development of educational components of the intervention, including pamphlets, BP cuffs for self monitoring, and support for patient education sessions. At the conclusion of Cycle 2, only a small number of patients (n=42) remained unreachable.

In Cycle 3, after exhausting all outreach efforts available with the QI team and student volunteers, the team partnered with the local county health department to conduct home visits for 42 hard-to-reach patients. Unfortunately, completing regulatory agreements and establishing secure referral processes exceeded the time available for the last 3-month cycle.

Statistical Analysis

The authors used descriptive statistics (means and SDs for continuous variables and frequencies and percentages for categorical variables) to characterize the demographics of the cohort at baseline. They evaluated the change from baseline to 9 months in systolic and diastolic BP, MPR, and appointments scheduled and attended after the intervention using a paired Student's t-test for comparison of means in 2 related groups. In addition, this study tracked improvement over time in the primary outcome, BP, using a statistical process control chart (Figure 2). This project was evaluated by the IRB and deemed exempt as a QI initiative.

RESULTS

Among all the participants in the intervention cohort (n=235), the average age at baseline was 57 (SD=12) years, and the majority were female (63%, n=148), Black (82%, n=193), and uninsured (52%, n=123) (Table 2). Evidence of substance abuse was identified in 32% of the 235 patients (n=75) through urine drug screens, electronic health record notes, and ICD-10 codes. Of the

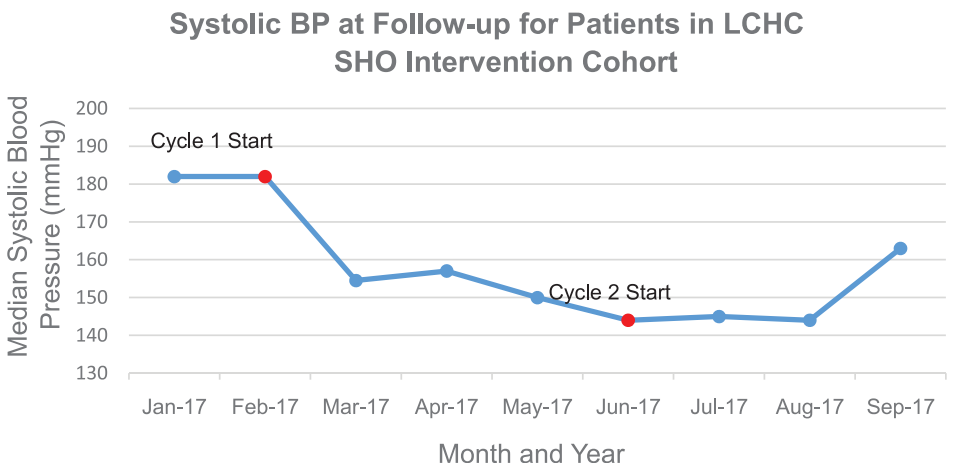

Figure 2. Results of BP after SHO intervention.
Apr, April; Aug, August; BP, blood pressure; Feb, February; Jan, January; Jul, July; Jun, June; LCHC, Lincoln Community Health Center; Mar, March; Sep, September; SHO, Severe Hypertension Outreach.

Table 2. Baseline Characteristics of the Cohort (*n*=235)

Patient characteristic	Baseline cohort (*n*=235)
Age, years (mean, SD [range])	57, 12 (23–85)
Sex, *n* (%)	
Male	87 (37.0)
Female	148 (63.0)
Race/ethnicity, *n* (%)	
Black, non-Hispanic	189 (80.4)
White, non-Hispanic	12 (5.1)
Hispanic	17 (7.2)
Other	15 (6.4)
Payer status, *n* (%)	
Uninsured	108 (46.0)
Medicaid	27 (11.5)
Medicare	40 (17.0)
Private insurance	60 (25.5)
Substance abuse documented, *n* (%)	
Any	75 (32.0)
Cocaine	46 (19.6)
ICD-10 for substance abuse in chart	22 (9.4)

235 patients, 46 (20%) self reported cocaine use or had a urine drug screen positive for cocaine.

During the intervention, a known follow-up appointment was attended by 77% of the population (*n*=181). Female patients were more easily reached (Table 3). At the conclusion of Cycle 3 (9 months), 92% of the 181 patients (*n*=167) who attended a return appointment had an improved systolic BP, with an average decrease of 33 mmHg (SD); and 80% (*n*=146) had improved diastolic BP, with an average decrease of 15 mmHg (SD) (Table 4). Of the patients who attended follow-up, 29% (*n*=53) attained controlled BP (≤140/90 mmHg) by the last visit (Figure 2).

The MPR improved from a baseline of 23% to 40% ($p<0.001$) among patients reached by pharmacists (*n*=30), and the use of the Lincoln Community Health Center in-house pharmacy increased from 37 patients to 92 patients during the study. Items from the ACPM SIMPLE principles (Table 1) that contributed to improved MPR included switching regimens to combination pills, discussing medications that patients feared, and altering expectations about side effects. The overall costs of the program as described in Figure 1 were approximately $22,000 for all providers combined, over the 3 cycles.

A total of 4 patients died during the 9-month duration of the study. A total of 3 of the patients were aged 55–70 years, were not attending follow-up appointments with a primary care provider, and suffered a stroke in their last months of life. The fourth patient was aged >80 years, was in care with a primary care provider, and died after a fall.

Table 3. Differences in Patient Characteristics and Outcomes (*n*=235)

Patient characteristic	Reached (*n*=193)	Not reachable (*n*=42)	*p*-value
Age, years, mean (SD; range)	57 (23–85)	56 (31–82)	0.338
Sex, *n* (%)			**0.009**
Male	64 (33)	23 (55)	
Female	129 (67)	19 (45)	
Race/ethnicity, *n* (%)			0.101/0.180
Black, non-Hispanic	155 (80)	34 (81)	
White, non-Hispanic	7 (3.6)	5 (12)	
Hispanic	16 (8.2)	1 (2.4)	
Other	13 (6.7)	2 (4.6)	
Payer status, *n* (%)			0.560
Uninsured	77 (40)	31 (74)	
Medicaid	26 (13.5)	1 (2.4)	
Medicare	37 (19.2)	3 (7.1)	
Private insurance	53 (27.5)	7 (1.7)	
Substance abuse documented, *n* (%)			0.706
Any	60 (31)	15 (35)	
Cocaine	40 (21)	6 (14)	
ICD-10 for substance abuse in chart	16 (8.3)	6 (14)	

Note: Boldface indicates statistical significance ($p<0.05$).

Table 4. Differences in Patient Outcomes after Intervention (*n*=235)

Outcome measures	Before intervention (*n*=235)	After intervention with follow-up (*n*=193)	*p*-value
Systolic BP (mean, SD)	184, 15.2	158, 26.7	**<0.001**
Diastolic BP (mean, SD)	101, 15.7	90, 16.5	**<0.001**
MPR, %[a]	23	40	**<0.001**

Note: Boldface indicates statistical significance ($p<0.05$).
[a]MPR calculable for the subset of patients using the Lincoln pharmacy for all the 3 cycles (*n*=30).
BP, blood pressure; MPR, medication progression ratio.

DISCUSSION

These findings suggest that implementing a team-based approach for severe hypertension successfully re-engages patients in care with a primary medical home, improves MPR, and is associated with lower BP over a 9-month period than baseline measurements. Results support the findings of studies conducted in similar patient populations. First, Olomu et al.[19] demonstrated in the Office Guidelines Applied to Practice study that severely hypertensive Black men were able to successfully reduce BP if they were able to be contacted, see a primary care provider, and obtain appropriate medications. Similar to Olomu et al.,[19] this intervention used a consistent plan of care implemented across pharmacists, social workers, nurses, and physicians to reach difficult-to-find patients and improve BP. In addition, it focused on a severely hypertensive cohort, was able to describe the prevalence of known substance use in the population, and reported improvements in MPR as a surrogate for medication adherence. These additional steps further characterize patients with severe hypertension in an underserved cohort, which highlights the need for further study regarding the relationship between BP and social determinants of health such as race, SES, and substance use. This work also adds to the existing literature regarding the relationship between MPRs and BP control in this socioeconomic demographic.

Another study, conducted in a similar patient demographic but using a different approach, focused on improving self care of chronic cardiometabolic illness using a CHW intervention.[24] In the study, Kangovi et al.[24] found that a CHW intervention improved diabetes, obesity, and smoking but did not improve hypertension. Of note, the baseline BP in the Kangovi et al.[24] cohort was much lower than that in this project, which may have contributed to their inability to demonstrate a significant effect with regards to BP.

A defining feature of this project's success was the interaction between complementary team members. The patient navigator was instrumental in the effectiveness of the intervention, educating patients about the importance of follow-up care, scheduling return visits, and addressing transportation challenges. The behavioral health team helped patients apply for patient assistance programs and medication vouchers as well as providing drug and alcohol abuse treatment resource information. The pharmacist identified barriers to medication filling in a timely way and educated providers about ways to surmount these barriers using the treatment algorithm (Appendix Figure 1, available online). Quarterly data analysis and meetings every 2 weeks allowed for nimble process change and adaptation to redesign care delivery from the initial patient contact to visit scheduling, appointment workflow, and the pharmacists' medication consultation processes. These changes resulted in significant improvements in both appointment attendance and BP.

Another unique feature of the Severe Hypertension Outreach project was the cohort selection. Only patients at the highest risk, with BP>180/110 mmHg, were targeted for this initial intervention. Although high rates of social and economic disparities are known to be associated with poor BP control and stroke,[25] among the patients in this study, the intervention was well-received and both MPR and BP improved.

More than two thirds (*n*=4,937) of the total original sample of patients with hypertension identified as non-Hispanic/Latino or Black/African. Fewer Black patients had controlled hypertension than non-Black patients (56% Black vs 63% non-Black were controlled in 2017) in the cohort at baseline (Table 1).[17] This is similar to national rates of BP control by race, with 56% for Black and 68% for non-Black patients reported nationally.[8] The relationship between Black race and higher risk for severe, uncontrolled hypertension and stroke has significant implications for overall community health in counties and communities that serve a higher proportion of Black patients. Successful interventions from other studies with different demographics and different challenges with regard to racial disparities may not have been as effective in this population.

A key lesson learned in the intervention was the need to modify patient navigator strategies to re-engage difficult-to-reach patients. A total of 3 examples included using a direct, empathetic communication technique,

allowing open access to immediate scheduling (within a week), and providing feedback to patients about the danger of high BP. The team found that patients' response was ideal when the number of questions asked was limited to 3 or fewer per encounter. The shorter call allowed patients to focus on the interaction and respond to questions concerning their personal health and availability for a follow-up appointment. Other changes implemented in later cycles of the PDSA focused on improving referrals to behavioral health and improving the follow-up appointment rate.

Another lesson learned was the advantage of using pharmacist outreach for this high-risk population. The federally sponsored 340B drug program allows pharmacies serving FQHCs to acquire and dispense medications at deeply discounted prices, resulting in decreased financial barriers for uninsured patients in this study. Pharmacist outreach calls, formulary changes to 90-day supply for all antihypertensive medications, and increased primary care provider awareness of how to work with the Department of Social Services and the in-house pharmacy led to improved MPR and decreased cost to patients. Same-day scheduling with patient navigators, social workers, or licensed practical nurses enabled subsidized transportation for medication pick up as well.

Future work to improve severe hypertension and prevent the progression of mild and moderate hypertension will include an effort to work more intently with community partners. Given the cost consciousness of the current healthcare environment, funding and personnel for QI efforts remain a high-priority yet limited resource. Efforts to engage Black men, the hardest-to-reach, highest-risk group, will build on lessons learned from this project. Specifically, the team will add a more tailored message regarding the relationship among hypertension, stroke, and kidney disease and the importance of not only timely medication refill but also adherence.

Finally, the authors observed that poor medication refill was associated with the inability to pay a copay, even on a sliding scale, and lack of transportation. Using local CHWs could alleviate these barriers and may improve guideline-based medication use, prevent severe hypertension, and lower the risk of stroke.

Limitations

This study was limited first by time because this project was done with minimal funding and had to be accommodated into normal staff work schedules. Secondly, nonworking phone numbers and incorrect addresses of many patients in the cohort made them impossible to reach. Third, the inability to provide home visits for those unable to travel meant that many patients were never reached for follow-up. Fourth, the opportunity to capture details associated with pharmacist's recommendations and subsequent changes based on the SIMPLE principles from the ACPM were not quantified. Finally, the study was not designed to identify which interventions contributed most to outcome improvement, so outcomes cannot be attributed to any one component of the intervention over another.

CONCLUSIONS

Severe hypertension is a dangerous condition associated with an increased rate of stroke and death. The objective of this project was to reduce severe hypertension in a primary care medical home using patient outreach, an interdisciplinary team, and evidence-based guidelines (Eighth Joint National Committee) for improved medication management. After three 3-month cycles, patients in a large urban FQHC with severe hypertension who were reached by the intervention had lower BP at follow-up. Further evaluation is needed to determine the effect of such an intervention among patients with concomitant behavioral health concerns, including substance abuse, and in lower ranges of uncontrolled BP.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2020.05.030.

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