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Exploring the Role of Pharmacists in Management of Hypertension in a Safety Net Clinic

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Abstract

Potrero Hill Health Center through the San Francisco Department of Public Health aims to deliver health promotion, disease prevention, heath maintenance, counseling, and health education of acute and chronic diseases. Hypertension is a common problem to both the health center and to the general population, and Potrero Hill Health Center aims to understand and develop a program that will aid in hypertension management at their local clinic. A supplemental pharmacist service was implemented at Potrero Hill Health Center to help manage hypertensive patients. Systolic and diastolic blood pressure levels were compared in patients receiving pharmacist counseling versus those receiving physician services only. Preliminary findings demonstrated that when compared to treatment as usual, those receiving supplemental pharmacist services had better hypertension control with significant reductions in both systolic and diastolic levels. Pharmacist counseling in community health clinics may have a beneficial public health impact in controlling hypertension, thus reducing potential complications of hypertension such as cardiovascular disease in low-income, minority populations.

According to the Centers for Disease Control and Prevention, 70 million American adults have hypertension, which translates to about 1 in every 3 adults. Among those, only half have their high blood pressure under control (CDC, 2016). Individuals of low socioeconomic status and of minority backgrounds are disproportionately affected by hypertension. Community safety-net clinics are burdened by low resources and struggle to maintain adequate hypertension control in low income and minority patients and reduce health disparities in cardiovascular disease in the U.S.

Background

Data from the National Health and Nutrition Examination Surveys (NHANES) 1999-2014 showed that 29.0% of adults had hypertension in 2011-2014 and the prevalence increased with age: 18–39, 7.3%; 40–59, 32.2%; and 60 and over, 64.9%, with a similar pattern between genders (Carroll et al., 2015). It was also higher among non-Hispanic black (41.2%) than non-Hispanic white (28.0%), non-Hispanic Asian (24.9%), or Hispanic (25.9%) adults. The prevalence of controlled hypertension was 53.0% overall, and those aged 18-39 were less likely to have controlled hypertension than those aged 60 and over. Between races, the prevalence of control was higher among non-Hispanic white (55.7%) than non-Hispanic black (48.5%), non-Hispanic Asian (43.5%), or Hispanic (47.4%) adults. Men and women had similar rates of control at 29.0% and 30.0% respectively. Among men with hypertension, non-Hispanic white (53.8%) adults had a higher prevalence of controlled hypertension compared with non-Hispanic black (43.8%), non-Hispanic Asian (39.9%), and Hispanic (43.5%) adults. For women with hypertension, the percentage of non-Hispanic white (59.1%) adults with controlled high blood pressure was higher than that of non-Hispanic black (52.3%) and non-Hispanic Asian (46.8%) adults (Carroll et al., 2015).

Hypertension is a major cause of illness and disability and significantly increases the risk for heart disease and stroke – two leading causes of death in the United States (CDC, 2016). While heart disease and stroke are among the most preventable diseases, they are also the most widespread and costly, accounting for hundreds of billions of dollars annually through healthcare expenditures and lost productivity. Hypertension alone cost the nation $46 billion annually, including the cost of health care services, medications to treat hypertension, and missed days of work. Additionally, it is a primary or contributing cause of death of more than 360,000 Americans each year (CDC, 2016).

Lack of education and understanding may be a barrier to adequate hypertension control. From 2011-2012, 82.7% of those with hypertension were aware that they had it, and 75.6% reported currently taking prescribed medications to lower their blood pressure, while only 51.8% had it under control (Burt et al., 2013). Taking antihypertensive medications was higher in women (80.6%) than men (70.9%) and increased with age: 44.5% for those aged 18–39, 73.7% for those 40–59, and 82.2% for those 60 and over. Non-Hispanic Asian adults were less likely to report taking antihypertensive medication (65.2%) than were non-Hispanic black (77.4%) and non-Hispanic white (76.7%) adults (Burt et al., 2013). This highlights that prescribing medication alone is not sufficient in controlling hypertension. While the control rate has increased from 29% in 1999 to an upwards of 54%, there is still room for improvement to meet the Healthy People 2020 goal of 61.2% (Carroll et al., 2015).

The American Heart Association has several recommendations on how to prevent and treat hypertension. Primary prevention begins with understanding one's risk factors, such as race, age, family history, comorbidities, and unhealthy habits. Secondary prevention involves having blood pressure checked and accurately diagnosed by a healthcare professional. Lifestyle changes

to adopt are part of both primary and tertiary prevention, including eating a healthier diet and reducing salt intake, engaging in regular physical activity, maintaining a healthy weight, managing stress, and avoiding or limiting tobacco smoke and alcohol. In addition, tertiary prevention includes compliance with medication if taken (American Heart Association, 2016).

Pharmacists Role in Hypertension Control

There has been limited but promising results with use of a pharmacist in aiding in blood pressure control and management amongst hypertensive patients in primary care settings. Whether a pharmacist was utilized in collaboration with a physician or more independently, the literature supports pharmacist roles as a significant factor in the care of hypertensive adults. Through pharmacist-lead clinics that focus on blood pressure, patients can receive individualized care towards their hypertension management, including proper titration of medications and closer monitoring of adherence to their medications, diets, and lifestyle habits. In a study conducted by Hunt et al. (2008), subjects who received the intervention of pharmacist-lead blood pressure consults achieved significantly lower systolic ($\Delta = 6$ mmHg, $p = 0.007$) and diastolic ($\Delta = 3$ mmHg, $p = 0.002$) blood pressures compared to control subjects (137/75 mmHg vs. 143/78 mmHg). In addition, 62% of those receiving the intervention achieved target blood pressure compared to 44% of those who did not ($p = 0.003$). The odds of achieving blood pressure target in the intervention group were 2.08 times higher than the control group. These results have been consistent in many studies that include pharmacists to manage blood pressure in primary care settings. In another study conducted by Carter et al. (2015), blood pressure control rate monitored after discontinuation of a pharmacist-lead program in a Veterans Health Administration setting. After 6 months, blood pressure remained to be controlled at a rate above 50%, but did not sustain over longer periods of time.

Based on research evidence, a "Blood Pressure Clinic" was implemented at an urban primary care community clinic to examine the effectiveness of a pharmacist lead hypertension management program. This paper reports on a preliminary evaluation of the "Blood Pressure Clinic" that aimed to increase blood pressure control in a predominately low income minority population with hypertension.

Potrero Hill Health Center: An Urban Safety Net Clinic

Potrero Hill Health Center (PHHC) is a primary care clinic located in San Francisco, California, in affiliation with the San Francisco Department of Public Health (SFDPH) and San Francisco General Hospital. It is among 12 clinics that provide primary care for adults, and includes services for pharmacy, nutrition, and mental, dental, and prenatal health. The overall mission of the SFDPH is to protect and promote the health of all San Franciscans, and through the help of clinics such as PHHC, patients can receive family-centered, comprehensive, and team-based care that is focused on quality and safety. The clinic is focused on delivering health promotion, disease prevention, heath maintenance, counseling, health education, and diagnosis and treatment of acute and chronic diseases. The target population of PHHC is minority adults of low-socioeconomic class. Amongst ethic backgrounds, 33.01% are Hispanic/Latino, 23.77% are Black/African American, 18.46% are White/Caucasian, 13.32% are Asian, 1.99% are Native Hawaiian, and the remaining 9.45% Other. Hypertension and diabetes are the most common morbidities seen at the clinic, with a prevalence of 35.17% and 15.99% respectively. The current blood pressure control rate is 65.8% among hypertensive adults at the clinic.

Evaluation of the Blood Pressure Clinic

Purpose

The purpose of the project was to examine whether utilizing a pharmacist-lead blood pressure clinic (BP Clinic) involving medication titration and health education would improve blood pressure control in hypertensive patients at the Potrero Hill Health Center.

Hypothesis

Individuals who attend at least one pharmacist-lead blood pressure session will have better blood pressure control than those who are provided usual care in a one-year period.

Methods and Criteria

Hypertensive patients at Potrero Hill Health Center in San Francisco, CA were observed over the course of a year, from July 2015-September 2016. Blood pressure readings were collected and analyzed at 3, 6, and 12-month intervals. Hypertensive patients were defined as those who had hypertension listed on their problem list on their electronic medical record (EMR). Blood pressure control was defined according to the Joint National Committee 8 (JNC-8) guidelines as:

- Age < 60 years **without** diabetes mellitus, chronic kidney disease, or other major comorbidities: < 140/90mmHg
- Age 60 years or older **without** diabetes mellitus, chronic kidney disease, or other major comorbidities: < 150/90mmHg
- Age 18 years or older **with** diabetes mellitus, chronic kidney disease, or both: < 140/90mmHg

Individuals who met the JNC-8 criteria were considered at goal. Those whose systolic or diastolic were higher than the JNC-8 criteria were considered above goal.

Starting July 2015, hypertensive patients at the clinic who had blood pressure levels above goal were referred to the pharmacist-lead blood pressure session held at the clinic once a week. Referrals were made by their primary care providers at regular appointments or through telephone outreach encounters. Patients in the usual care arm were not referred by primary care provider, or did not attend a BP clinic session after a referral. Demographic data including age, race/ethnicity, and diabetes and chronic kidney disease status were collected on those who attended BP Clinic and those who did not.

BP Clinic was held once a week at PHHC on Fridays, with an average of 3-4 sessions per month. It was lead by a single pharmacist who had access to patients' EMR and knowledge of their clinical history. Each session included taking a blood pressure reading, follow-up with medication adherence, medication titration and education on recommended diet and exercise regimens to improve blood pressure. Outreach calls were made using the hypertension registry collect from the health database i2i, which was filtered to patients at PHHC, patients with hypertension on their problem list according to EMR, and patients who had at least one blood pressure reading above goal defined as SBP >/= 140 or DBP >/= 90 from January 1, 2015 – September 31, 2016. A total of 120 patients were in the BP clinic cohort and 296 in the usual care cohort. Among the BP clinic cohort, baseline blood pressure was determined by the most recent reading prior to their first BP Clinic session that was above goal. Among the usual care cohort, baseline blood pressure was determined by a reading above goal on or before September 2016. Using the date of the baseline blood pressure, 3, 6, and 12-month intervals were taken from there. Due to the observational method of collection, it was likely that patients did not have a reading at a certain time interval. In that case patients were not excluded from the study; rather, there was just one less data point to utilize for that time interval. At the end of the one-year

study, any patient (usual care group) who did not have a 12-month blood pressure listed was substituted with the most recent reading available within the study time frame. For both cohorts, a single blood pressure reading was utilized for each time interval. If multiple readings existed, the last one was used.

The following outcomes were measured: primary—comparing the percentage of patients with blood pressure control as defined by the JNC-8 guidelines between those who attended BP Clinic and those who did not after 12 months; secondary—comparing demographic differences observed between the two cohorts.

Statistical Analyses

Two independent sample t-tests were used to test whether the average difference between the two cohorts were significant or due to random chance. Excel software and Google calculator were used to compute data.

Results

Patients who attended at least one session of BP Clinic had a greater percentage of blood pressure control as defined by the JNC-8 Guidelines at the end of one year (71.67% vs. 53.04%, see Table 1). Overall average systolic and diastolic blood pressure in both cohorts were considered at goal, or below 140 and 90, at the end of one year. However, when looking at individual cases, average systolic blood pressure in the BP Clinic cohort was 134.9 mmHg compared to 139.1 mmHg in the usual care cohort, and the difference was significant at the alpha = 0.05 level, df = 414, t = -1.649 (t = -2.027, p = 0.021651). Average diastolic blood pressure was 78.0 mmHg in the BP clinic cohort compared to 84.6 mmHg in the usual care cohort, and was significant at the alpha = 0.05 level, df = 414, t = -1.649, (t = -5.540, p < 0.00001). Average change in systolic and diastolic blood pressure was greater among the BP clinic cohort compared

to usual care (SBP Δ19.43mmHg vs. 16.45mmHg; DBP Δ9.23 vs. 8.50) (See Figure 1-4). In both cohorts, African Americans were the most prevalent. Asian was the second most prevalent in the BP Clinic cohort, while White was second in the usual care cohort. Hispanic/Latino was third most prevalent for both cohorts. There were also a larger percentage of patients who had diabetes or chronic kidney disease among those who attended BP Clinic compared to usual care (49.17% vs. 35.47%).

Table 1: Blood Pressure Control and Demographics

BP CONTROL AT 1 YEAR

	BP Clinic **%**	Non-BP Clinic **%**
Yes	71.67	53.04
No	28.33	46.96

BLACK/AFRICAN AMERICAN BP CONTROL AT 1 YEAR

	BP Clinic **%**	Non-BP Clinic **%**
Yes	61.36	48.21
No	38.64	51.79

RACE/ETHNICITY

	BP Clinic **%**	Non-BP Clinic **%**
Black/African American	36.67	37.84
White	10.0	16.55
Hispanic/Latino	15.83	16.22
Asian	19.17	15.20
Native Hawaiian/ Other Pacific Islander	2.50	3.38
Other/Refused	15.83	10.81

DISEASE STATUS

	BP Clinic	Non-BP Clinic
YES Diabetes/ Chronic Kidney Disease	59	105
NO Diabetes/ Chronic Kidney Disease	61	191
Total	120	296
Percent Yes	**49.17%**	**35.47%**

Figure 1: BP Clinic

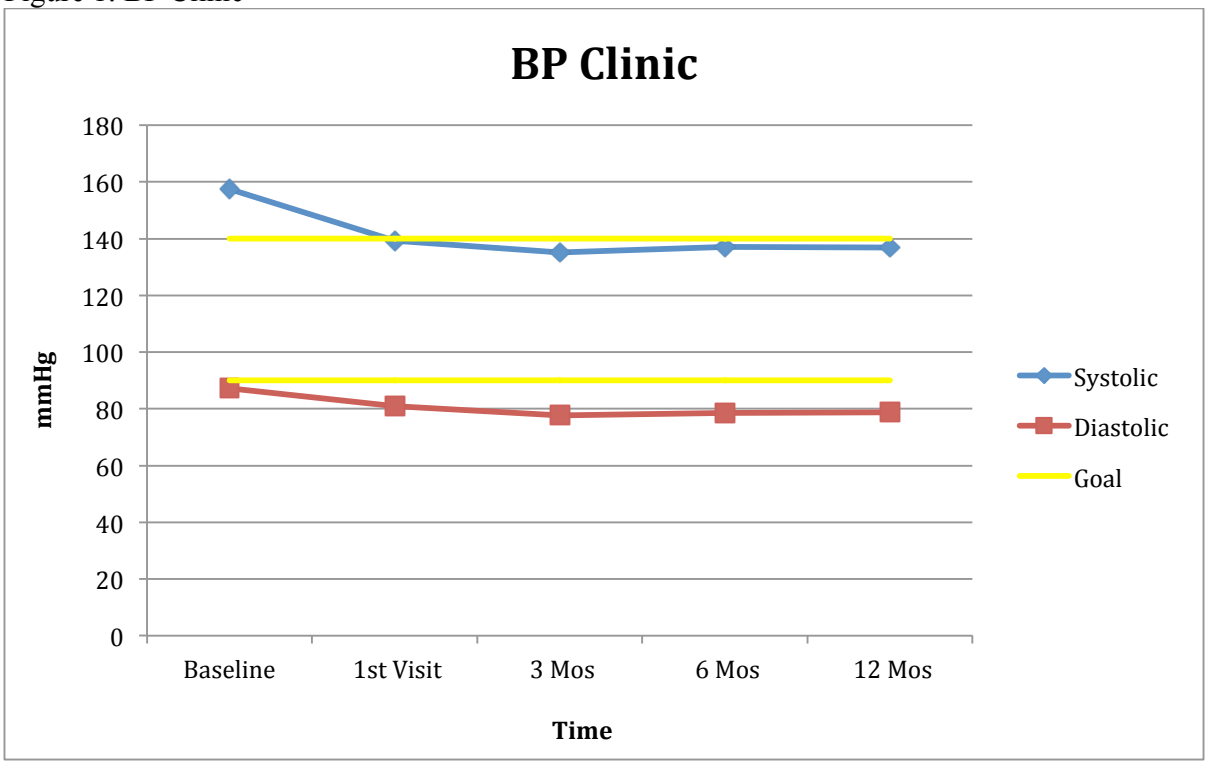


Figure 2: Usual Care

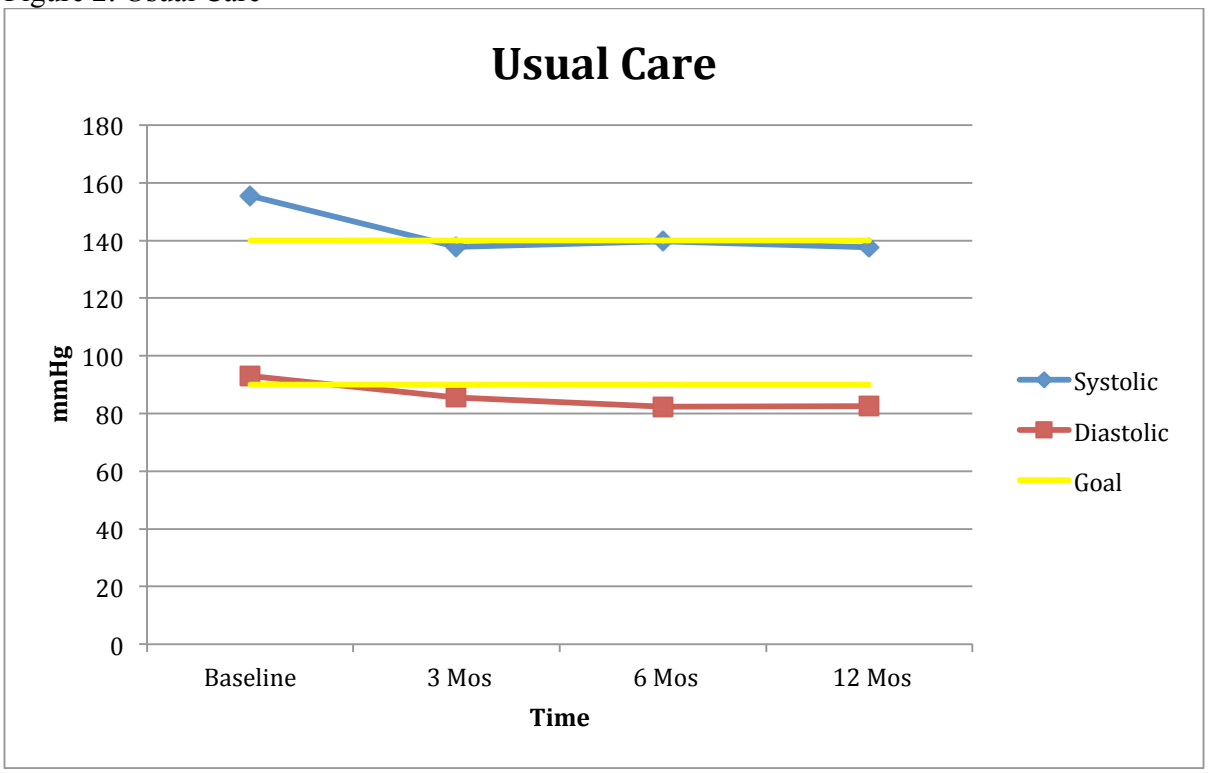


Figure 3: BP Clinic vs. Usual Care Line

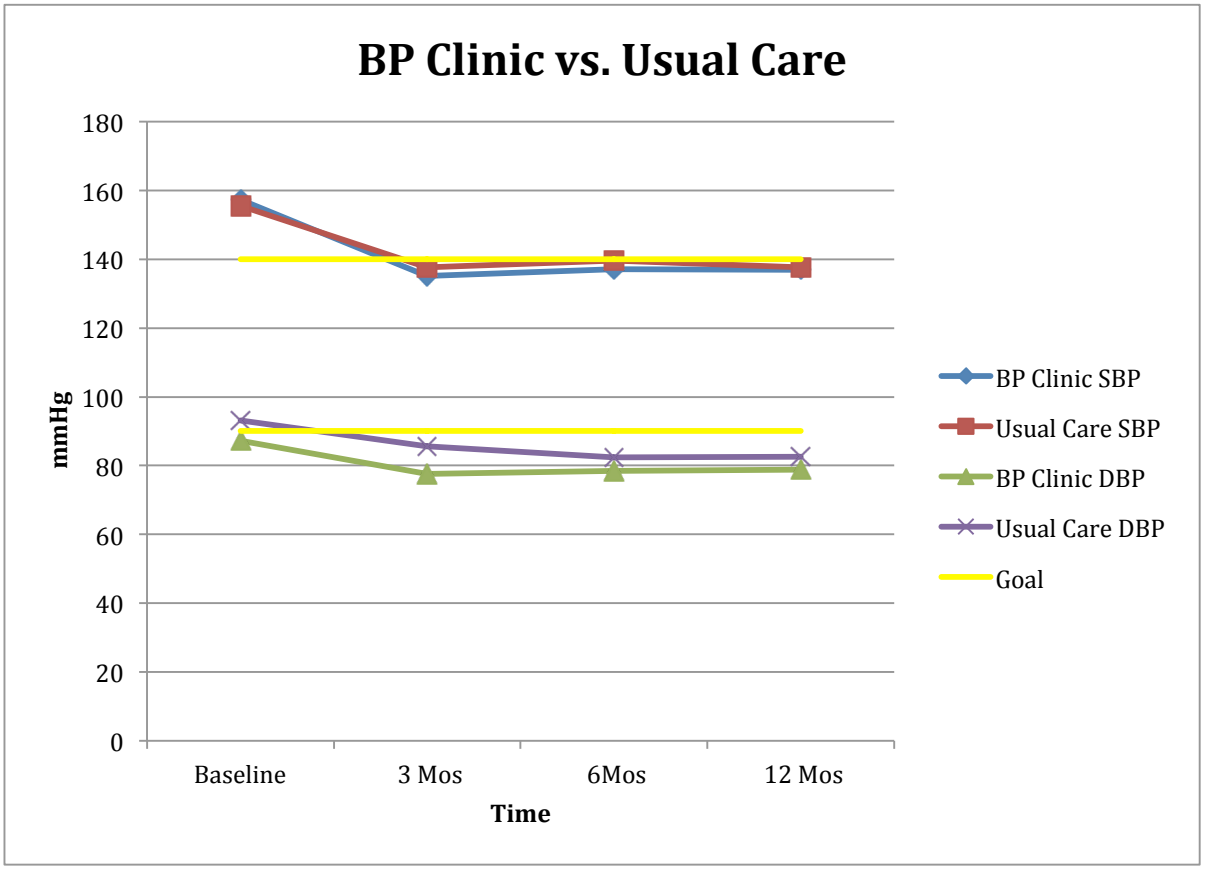
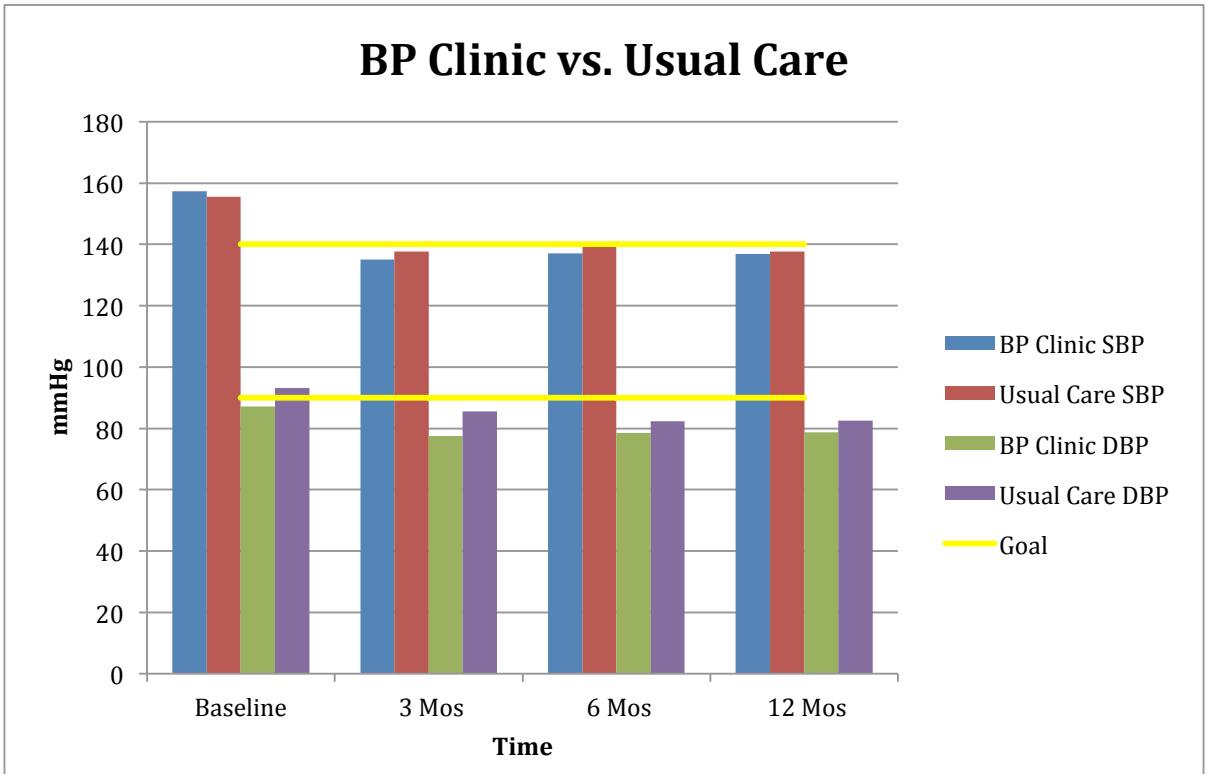


Figure 4: BP Clinic vs. Usual Care Column



Limitations

This evaluation had many strengths including no additional cost to perform the study and use of the same pharmacist, which promoted consistency. However, several limitations also existed. Patient attendance could not be predicted or controlled, which resulted in data gaps at certain time periods. Additionally, the method of data collection could have been influenced by behavioral factors. Blood pressure measurements are sensitive and change according to posture, exercise, sleep, stress, mental health, caffeine, and smoking. Utilizing a single event reading on does not necessarily indicate the patient average blood pressure control. Recommended guidelines to accurately diagnose hypertension include averaging 2-3 readings after a patient has been sitting quietly for five minutes. In this study we could not control for environmental factors and used the last single blood pressure reading rather than an average. Lastly, missing data was not replaced or omitted, so each time interval represented a different cohort.

An important factor to consider is that there were a higher percentage of diabetic/chronic kidney disease patients in the BP Clinic cohort. Patients who have symptomatic comorbidities such as diabetes and chronic kidney disease may tend to be more involved with their personal health, compared to those with a sole diagnosis of hypertension therefore are more likely to seek medical care. Behavioral modifications and treatments that patients with diabetes/chronic kidney disease are already utilizing can also have a positive effect on their blood pressure.

Public Health Significance

Interventions that include pharmacists to improve blood pressure control in hypertensive adults have shown promising results. In many primary care settings physicians have limited face-to-face time with patients to discuss comprehensive blood pressure management.
Utilizing ancillary clinic staff such as clinical pharmacists to titrate medications and reinforce

medication adherence and lifestyle changes should be used as a best practice method for hypertension management in order to meet the Healthy People 2020 goal of 61.2%. Improving blood pressure control also closes the gap in health disparities by reducing cardiovascular disease and increases cost savings of the nation.

Conclusion

Hypertension management is imperative because it is common in the population, especially among low-income, underserved populations, which are frequently the target population when we address any public health issue. The potential consequences of uncontrolled or untreated hypertension not only affect the people who have it, but also the people who are around them such as friends and family. Further attention about education is imperative not only to the disease itself, but for the general health of our population. Promoting lifestyle changes such as eating a healthy diet and engaging in regular physical activity is applicable to overall improved health, and has shown to be a positive effect on mental health, women and children's health, improved performance at school, and so forth. It is a disease that everyone should be aware of, and one that everyone should understand how to prevent or treat.

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Appendix A. Literature Grid

Author Date	Purpose	Design	Instruments	Subjects	Results	Limitations Weaknesses
Hunt et al. 2008	Pharmacist practitioners vs. usual care in hypertension management, community-based setting	Single-blind, RCT	Mailed invitations, self-reported questionnaires, appropriate sized cuffs and standard mercury sphygmomanometer	A total of 463 subjects (n = 233 control, n = 230 intervention)	Subjects in the intervention arm had significantly lower systolic and diastolic blood pressures compared to control, 62% of intervention subjects achieved target blood pressure compared to 44% of control subjects. Minimal differences between groups in hypertension-related knowledge, medication adherence, quality of life, or satisfaction.	Single-blind study, 16% response rate, combination drug therapy in the intervention arm
Wal et al. 2013	Pharmaceutical care (patient education, prescription assistance, and the life style modifications) vs. none	RCT	Short Form-36 quality of life questionnaire, pictograms, interviews	20 to 75 years old, 102 total, (n = 48 control, n = 54 intervention)	Intervention arm had significantly lower systolic and diastolic blood pressures compared to the control arm, and also had better mean score on the quality of life questionnaire.	Baseline blood pressure was compared to 1st follow-up and 2nd follow-up measurements, however, length of time between appointments not specified
Carter et al. 2015	Examine blood pressure control after discontinuation of pharmacist-managed intervention	RCT	10-item Pfeiffer Short Portable Mental Status Questionnaire, automated BP machine	Iowa Veterans Administration, 123 total participated (62 stop intervention, 61 continue intervention)	Significant decrease in blood pressure among those who continued the intervention after 6 months. Data for 12, 18, and 24-month intervals were not statistically significant to conclude ($p>0.1$)	Unable to generalize to population outside the VA; patients were largely male, Midwestern, and Caucasian; high p-values

Hirsh et al. 2014	Pharmacist practitioners vs. usual care in	RCT	Clinical collaborative practice protocol, manual wall-mounted sphygmomanometer	Age 18 and older, n = 75 intervention arm, n = 91 control	More patients in the intervention arm were at blood pressure goal at 6 and 9 months compared to usual care. Reduction in average BP was also greater in the intervention at 6 months, but was not statistically significant at 9 months	Not generalizable due to single university-based general internal medicine practice; patient had to be able to speak, read, and write English; patients received small payments for each clinic visit; participation bias because those who were in the intervention knew that they were and those in usual care did not
Carter et al. 2015	Physician/pharmacist collaborative model primary care medical offices across 15 states	Prospective, cluster-randomized trial	Survey to score clinical pharmacy services	625 total subjects (n = 401 intervention, n = 224 control)	Blood pressure not controlled (not statistically significant), however, reduction in mean blood pressure was greater in the intervention arm than control	Only generalizable to similar settings, subjects involved were not masked
Santschi et al. 2014	Pharmacist interventions (alone or in collaboration with other healthcare professionals)	Meta-analysis of RCTs	MEDLINE, EMBASE, CINAHL, and CENTRAL databases	39 RCTs representing 14,224 patients, trials were published between 1973 and 2013 in peer-reviewed journals	Compared with usual care, pharmacist interventions showed greater reduction in systolic and diastolic blood pressure. The effect tended to be larger if the intervention was led by the pharmacist and was done at least monthly.	Publication bias, small studies showing weak or no effect may not have been published
Bodgen et al. 1998	Physician and pharmacist teamwork approach	Single-blind, RCT	n = 49 intervention, n = 46 control	Interviews, JNC-5 guidelines	More than double the percentage of those in the intervention arm achieved blood pressure control compared to control, with greater decline in diastolic and systolic blood pressures	Small sample, randomization not guaranteed, even or odd last digit SSN was entered by a person, who could easily figure out the pattern
Montgomery et al. 2001	Compare patient preferences of treatment to recommended guidelines	Observational study	Interviews	52 patients responded to invitation (out of 100), which were chosen randomly	Individuals vary widely in their preferences for possible outcomes, marked disagreement with results from decision analysis	Low response rate, chose to participate

Heymann et al. 2012	Explore beliefs and perceptions of hypertension, gain understanding of barriers	Qualitative study	Focus groups	10 focus groups, 86 total people	Participants saw hypertension has a risk factor for MI or stroke, rather than a disease. Viewed as a binary risk process (have it or not) rather than a continuous, degenerative process. Diabetic patients more likely to accept hypertension as a chronic illness with minor impact on their routine, and less important than their diabetes. Stress was overestimated as the most important causative factor.	Participants were agreeable to participate, may have high health awareness, doesn't highlight the extent of non-adherence of hypertension
Jolles et al. 2013	Assess knowledge and beliefs of hypertension	Qualitative study	Semi structured interviews with topic guide, 30-60 minutes	Age 18 older, 26 total patients	Only half of patients were able to recall optimal or target blood pressure. The majority could recall consequences of hypertension. Patients aware of the impact of lifestyle modifications, however, failed to translate this into implementation. A lack of a routine for medication use was the most frequently reported barrier to proper BP control. Physicians too busy to answer questions, 69% received more information from another healthcare professional.	Small sample, participants agreed to participate (participation bias)
Appel 2003	Lifestyle modifications to control blood pressure	Review article			Increasing physical activity, maintaining healthy body weight, moderate alcohol intake, diet high in fruits, and vegetables, potassium and low in fat and salt	
Collier and Landram 2012	Medications and/or lifestyle	Review article			Consider white coat hypertension (increased blood pressure when a clinician is present)	

Appendix B. Competencies & Goals & Objectives

Competencies Achieved

Throughout this fieldwork I completed learning objectives that contributed to my achievement in the University of San Francisco's Master of Public Health competencies, including:

1. Assessing, monitoring, and reviewing the health status of populations and their related determinants of health and illness
2. Demonstrating the ability to utilize the proper statistical and epidemiologic tools to assess community needs and program outcomes
3. Identifying and prioritizing key dimensions of a public health problem by critically assessing the public health literature
4. Demonstrating leadership abilities and effectively communicating with partners as a collaborator of evidence-based public health projects

Goals and Objectives

Goal 1: Identify and Explore a Public Health Problem at Potrero Hill Health Center (PHHC)

Objectives	Activities	Timeframe	Who is Responsible	Tracking Measures
Identify which morbidities are the most prevalent at PHHC	Ask providers and staff about most common problems in the population	Mar 22 - Apr 12	Pandora and appropriate staff	Provided list of most common problems

Understand why the problem exists, intervention and best-practices to combat the problem	Conduct literature review	Mar 22 - Sep 22	Pandora	Read lit reviews

Goal 2: Understand the Importance of Engaging and Maintaining Communication with Partners

Objectives	Activities	Timeframe	Who is Responsible	Tracking Measures
Have at least one 30-minute meeting with preceptor once a week while on site	Communicate on-site days with preceptor to set meeting up	Mar 22 - Nov 3	Pandora and Preceptor	Notes taken from meeting
Communicate via email as needed	Email questions concerns when preceptor or student unavailable for meetings	Mar 22 - Nov 3	Pandora and Preceptor	Email exchanges

Goal 3: Understand Different Data Analyses Techniques and Appropriately Utilize Towards a Quality Improvement Project

Objectives	Activities	Timeframe	Who is Responsible	Tracking Measures
Explore the different types of studies and methods used	Conduct literature review	Mar 22- Nov 3	Pandora	Read lit reviews
Collect and organize data	Create spreadsheets, tables, and graphs	Mar 22- Nov 3	Pandora	Spreadsheets, tables, and graphs made
Conduct analyses for conclusion	Identify and perform test	Jul 6 - Nov 3	Pandora	Results and p-values

Goal 4: Increase Participation Rates of Current Programs at PHHC

Objectives	Activities	Timeframe	Who is Responsible	Tracking Measures
Assess current participation rates and outreach strategies of programs	Ask providers and staff for data on participation rate	Mar 22 - Nov 3	Pandora and appropriate staff	List of rates
Determine preferred method of communication among patients	Ask providers and front desk to include communication preferences during visit	Mar 22 - Sept 22	Pandora and appropriate staff	Preferred method listed in medical record chart
Broaden scope of outreach	Create new flyers for existing programs	Mar 22 - Sep 19	Pandora	Flyers made