

Project IMPACT: Hypertension

Outcomes of a Pharmacist-Provided Hypertension Service

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Abstract

Objective: To evaluate the impact of pharmacists, working collaboratively with patients, on blood pressure control, lifestyle goal setting, adherence to antihypertensive therapy, patient knowledge and satisfaction, and modification of cardiovascular risk factors.

Methods: Self-declared hypertensive patients met with the pharmacist for blood pressure monitoring, lifestyle goal setting, and education about medications and disease state on four occasions over a 6-month period.

Practice innovation: A community pharmacy partnered with an employer wellness plan to provide education and monitoring for patients with hypertension based on home blood pressure readings obtained using monitors that wirelessly transmit information to the pharmacist. **Main outcome measure(s):** Percentage of patients at blood pressure goal, mean blood pressure, percentage of patients with lifestyle goals, medication adherence, patient knowledge and satisfaction, and modification of cardiovascular risk factors. **Results:** Patients not at their goal blood pressure at baseline had a significant decrease in blood pressure and a significant increase in achievement of their blood pressure goals. Across the population, no significant changes were seen in the primary outcome, lifestyle goals, medication adherence or modification of cardiovascular risk factors. Patient knowledge increased from baseline and satisfaction with the service was high. **Conclusion:** Blood pressure control improved in patients not at their treatment goal. All patients increased their knowledge about hypertension and reported high satisfaction with the pharmacy service. Pharmacy services should be offered to patients who are more likely to reap a benefit. Home blood pressure readings are useful to inform clinical decision making and supplement patient consultation within the pharmacy setting.

Relevance and Contribution to Literature

Over 74 million Americans have elevated blood pressure that warrants treatment.¹ Uncontrolled hypertension leads to end stage renal disease, heart failure, myocardial infarction, stroke, and is the number one attributable risk factor for death throughout the world.² Despite understanding the risks associated with hypertension, approximately 30 percent of adults are still unaware that they have hypertension, greater than 40 percent of individuals with hypertension are not being treated, and two-thirds of hypertensive patients on

medical therapy are not being controlled to their optimal blood pressure goals.³ Non-adherence to lifestyle changes and medications has been identified as a barrier to optimal antihypertensive therapy.⁴

Patient education, simplifying regimens, and behavioral strategies to remind patients to take their medications have all been shown to improve adherence to medications and blood pressure control.⁵ Pharmacists are in a unique position to provide education to patients with hypertension and to implement other strategies to improve adherence to lifestyle changes and medication regimens. Project IMPACT: Hypertension introduces a new element into pharmacist-provided care by equipping patients with unique home blood pressure monitoring devices that can wirelessly transmit readings to the pharmacy computer. This information is used

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by the pharmacist when assembling a complete picture of that patient's blood pressure control during face-to-face visits. Incorporating home blood pressure monitoring data provides the pharmacist with the unique teaching opportunity of relating treatment and monitoring with patient goal setting.

Objective

Project ImPACT: Hypertension created a value-based hypertension benefit, by partnering with an employer that includes appropriate financial incentives to employees to encourage their participation in the program, which includes education, monitoring, and counseling. This project utilized a model of patient-focused pharmacy care that incorporated structured visits, financial incentives, enhanced self-monitoring, and disease state, lifestyle, and medication education. The objectives of Project ImPACT: Hypertension were to:

- Assist identified patients with hypertension in achieving national treatment goals;
- Increase nutritional, exercise, and weight loss goal setting among patients with hypertension;
- Improve participant adherence to medication therapy;
- Improve patient knowledge and health satisfaction; and,
- Modify cardiovascular risk factors.

Practice Setting

University Pharmacy is an independently owned community pharmacy located on the campus of Wayne State University in Detroit, MI, employing one pharmacist and two technicians. The pharmacy focuses on a patient-centered approach to maximize medication adherence so patients reach their clinical goals and improve their quality of life. University Pharmacy strives to incorporate research and modern pharmacy practice to serve faculty, staff, and students of Wayne State University and those living in the metro-Detroit area. A dedicated consultation room at the pharmacy is equipped with patient assessment devices and serves as a private space for the provision of clinical pharmacy services. University Pharmacy's owner and chief pharmacist is certified to administer immunizations, Clinical Laboratory Improvement Amendments (CLIA)—waived tests for cholesterol and diabetes monitoring, and Medication Therapy Management (MTM). Approximately 80% of her time is spent providing clinical services. In addition, she is a preceptor for Wayne State University and precepts approximately 8 six-week Advanced Pharmacy Practice Experiences per year. These students are integrally involved in providing clinical services to patients.

Partnering with employers on health promotion programs provides an opportunity for pharmacy services to show a measurable impact and provide resources to improve patient adherence and participation. University Pharmacy has a history of partnering with Wayne State University to improve employee health through the Wellness Warriors Program. Wellness Warriors offers financial incentives to full-time Wayne State University employees to participate in health screenings, wellness coaching, and diet and exercise programs throughout the year. The University Pharmacy has provided the cardiovascular risk screening (including cholesterol, blood pressure, BMI, and healthy lifestyle) and immunizations to employees for the past 4 years.

Methods

This pharmacy hypertension service was offered to employees participating in the Wayne State Wellness Warriors Program. Information about the hypertension service was available during the Wellness Warrior health screenings which were available to all university employees. Banners were also present on the Wellness Warriors website with information about the program. University employees were eligible for this service if they were self-identified as having a diagnosis of hypertension or pre-hypertension. Patients did not qualify for this service if they were pregnant, nursing, under 18, or over 89 years of age. Partnering with the Wayne State University Wellness Warriors Program provided the opportunity to incentivize patients to complete the 6 month program. Patients received \$50.00 from the Wellness Warriors at the completion of the follow-up, which was intended to provide resources for them to become empowered and to take control of their health. No payment was made directly from Wayne State University to the University Pharmacy.

Participants enrolled in the pharmacy hypertension service met with the pharmacist or student pharmacist 4 times over a 6-month period at the University Pharmacy. Visits were typically scheduled 6-weeks apart, but some scheduling adjustments were made to accommodate patient requests and clinical needs. Pharmacists and student pharmacists who were involved in the service were required to complete a training module and pass a competency exam. Prior to the first visit participants completed a medical intake form and a knowledge and health satisfaction survey. The first visit was 45-60 minutes and subsequent visits were 15-30 minutes each. The majority of time during each visit was dedicated to education and coaching about blood pressure, lifestyle modifications, adherence, and goal setting. Patients were not only encouraged to be adherent to their medication therapy, but also to create realistic lifestyle goals. Additionally, the pharmacist or student pharmacist performed a clinical

assessment; which included blood pressure measurement, weight, and an interview to assess goal setting and adherence. This data was recorded on a visit encounter form. The visit encounter form was also used to record any medication-related concerns identified by the pharmacist or student pharmacist, how they were addressed in the therapeutic plan, and the status of their resolution. Written letters were used to communicate directly with physicians. Patient education materials compiled by the American Heart Association and the National Institutes of Health were also provided to all participants. Activities performed during each visit are detailed in Table 1.

At the end of the 6 months or after 4 visits, participants completed another knowledge and health satisfaction survey with additional questions regarding their perception of pharmacy services. The process of care was designed based on successful chronic disease modeling experiences from the APhA Foundation along with integration of JNC7 clinical practice guidelines.⁶⁻¹³ Approval for this project and data collection was obtained from the Institutional Review Board of Wayne State University and informed consent was obtained from all patients.

Practice Innovation

Employees who participated in the pharmacy hypertension service were given a home blood pressure monitor (model number UA-851THW) and pedometer (model number XL-20), which are part of A&D Medical's Wellness Connected™ series. The devices had the capability to wirelessly transmit device data, including the complete set of home blood pressure measurements, to the pharmacy computer. The devices provided blood pressure measurements equivalent to those obtained by a trained observer using the cuff/stethoscope auscultation method within the limits prescribed by the American National Standards Institute for electronic or automated sphygmomanometers. The pharmacist trained patients to use the devices pursuant to the instructions that accompanied the devices. Patients were instructed to take their blood pressure according to the schedule provided by their primary care provider, or a minimum of once daily and when they felt that their blood pressure may be high. Patients were also instructed to keep a diary about activities that may have impacted any out-of-range blood pressure readings.

At each visit, the patient brought in the blood pressure devices and the pharmacist uploaded the data onto the pharmacy computer. A software program created a graph marked with color indicators to visually represent the patient's readings in relation to goal. The color indicators were the same as those reported by the blood pressure

monitored when used at home. The pharmacist used the green (at goal), yellow (borderline), orange (stage I hypertension), and red (stage II hypertension) indicators as a springboard for discussion with the patient about causes of blood pressure variability. Through these targeted conversations about the home readings and diary entries, the pharmacist was able to identify patterns and hypertensive triggers. Examples of patients' triggers that were identified through the analysis of home blood pressure readings are described below:

- One patient identified that the three to four beers he consumed on Saturday nights was causing an increase in his blood pressure. Further discussion with the pharmacist helped to clarify this behavior as binge drinking, as the patient did not drink any other day of the week. The pharmacist was able to help the man identify alcohol as a hypertensive trigger and modify his lifestyle to keep his blood pressure under control.
- A few patients within the program reported that they were non-smokers. However, once the pharmacist began to identify a pattern of elevated home blood pressure readings, the patients revealed that they were occasional smokers. The pharmacist was able to use the graphs of the home readings to show the patients the impact smoking has on their blood pressures and how lifestyle modifications can improve their health.
- One of the patients in the program was a professor. Through review of the downloaded blood pressure readings, the pharmacist identified a pattern of elevations in blood pressure at a specific time each week. With the help of the professor's assistant, the professor identified that the elevation coincided with a standing appointment with one particular student. The pharmacist counseled the professor about stress management techniques to help keep blood pressure under control even during challenging situations.

Although these are anecdotal examples, blood pressure monitor records contributed in-depth information about home readings that impacted clinical decision-making and education plans. The daily readings and activity levels showed previously unidentified patterns and triggers of blood pressure variability. Additionally, the use of the software that accompanied the wireless devices visually represented blood pressure control which highlighted the silent nature of hypertension and the impact of lifestyle. Further projects and investigations to define the role of this technology and its impact on outcomes are warranted.

Main Outcome Measures

The primary endpoints are targeted to show changes in participants' blood pressure measurements, reported as the percentage of participants meeting blood pressure goal at baseline compared to the end of follow-up. Blood pressure goal, as defined by The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7),² is a blood pressure <140/90 mmHg. In patients with concomitant diabetes or renal disease, the blood pressure goal is <130/80 mmHg. The change in average blood pressure for the group of participants is also reported. Blood pressure readings collected by the pharmacist or student pharmacist on the day of each visit were utilized as endpoint data for the purpose of analysis.

Secondary endpoints included goal setting, medication adherence, patient knowledge and satisfaction, and modification of cardiovascular risk factors. Percentage of patients with goals related to nutrition, exercise, and weight loss, as well as percentage of patients who were adherent to therapy, were compared from the beginning to the end of the follow-up period. Goal setting and adherence to medication therapy was self-reported verbally to the pharmacist during visits, which was documented on the visit encounter form. Participants were designated as "having set goals" or "not having set goals" in the areas of nutrition, exercise, and weight loss. Participants were designated as "adherent" (< 6 out of 30 days of missed medication) or "non-adherent." Participant knowledge was determined by comparing pre- and post-intervention survey results. Satisfaction with pharmacist care was measured only at the completion of the follow-up period. Participant modification of cardiovascular risk factors was determined based on pharmacist-collected BMI data from baseline and follow-up visits as well as from pharmacist-patient interviews related to smoking status throughout the project.

A Microsoft Access database was used for initial data analysis and summary statistics. SAS software was used for additional statistical analysis. Continuous data was analyzed using a paired *t* test and categorical data was analyzed using a Chi-square or Fisher's exact test where appropriate. The a priori level of significance was set at 0.05.

Results

A total of 152 participants chose to engage with this new health plan benefit. The average age for all patients was 51 with an average BMI in the obese range. More African Americans than Caucasians were included, with a small number of other ethnic groups. At baseline, more than 80% of all patients reported that they were adherent to therapy

and more than 75% reported having goals for nutrition, exercise, and weight loss (Table 2). The overall population demonstrated no significant differences in the primary endpoints. In addition, no differences in goal setting, adherence, or cardiovascular risk factor reduction were realized (Table 3).

According to survey data from baseline compared to the final visit, perceptions of disease state knowledge were improved in all areas from baseline. At the end of follow-up, significantly more patients reported that it is important to: take their blood pressure medications and manage their blood pressure through diet and exercise. In addition, more patients felt informed about their blood pressure diagnosis, blood pressure goals, and signs and symptoms of heart attacks and strokes (Table 4). In addition, after participation, patient satisfaction with pharmacy services was high in all participants, with 99.2% of patients agreeing that they would recommend others to pursue a hypertension pharmacy service.

A subgroup of patients who were not at their blood pressure goal at baseline (n=62) was evaluated post hoc. Baseline characteristics were similar among the subgroup and the full study population (Table 2). The subgroup of patients had a significant reduction in blood pressure from baseline to the end of follow-up. (Table 5). There were no significant changes in goal setting, adherence, or cardiovascular risk factor reduction in the subgroup.

Discussion

The benefits of pharmacy involvement in the care of hypertensive patients have been reported as early as 1973.¹⁴ Since that time, the impact of pharmacist involvement in the management and outcomes in patients with hypertension has been demonstrated in multiple settings showing improvements in blood pressure control and other cardiovascular risk factors.^{15,16} Pharmacists have notably been reported to have significant impact on hypertension control rates when electronically engaged with patients for consultation in combination with web-based education and home blood pressure monitoring.¹⁷ Most recently, home blood pressure telemonitoring along with pharmacist-provided management and dosage adjustments have significantly improved hypertension control in patients.¹⁸

In the current report, participating patients were self-identified as pre-hypertensive or hypertensive and enrollment may have been based more on incentives provided than a true health care need. Subsequently, the average blood pressure for the patients in the project was 132/83. When patients were analyzed based on their baseline

blood pressure, patients not at goal experienced a benefit from this pharmacy intervention. This finding supports a nuanced approach to pharmacy services which selects patients who would glean the most benefit from an intervention. This is congruent with previous studies demonstrating a blood pressure benefit which included patients with blood pressures that were higher or not at goal.^{19, 20}

There was no demonstrated difference in self-reported goal setting or self-reported medication adherence. Baseline goal setting and adherence was high, with over 75% of patients with lifestyle goals and over 80% of patients reported that they were adherent to medication therapy. High baseline rates and maintenance of commitment to the goals over the 6-month program may be due to participant selection from patients already engaged in the Wellness Warriors Program, in which lifestyle and wellness are key topics. Due to the self-reported nature of the goals, limited conclusions can be drawn from this data. Although goal setting is not a common outcome in evaluation of pharmacist impact, pharmacists should embrace the opportunity to champion lifestyle interventions in a comprehensive approach to improving hypertension outcomes.²¹ Future studies should evaluate goal setting and pharmacist impact on patient's ability to formulate appropriate lifestyle goals and to achieve them.

This structured interaction with the pharmacist resulted in a significant improvement in patient knowledge. As evidenced by the survey results, after completion more patients felt they understood their diagnosis of hypertension and knew their blood pressure goal. They had a greater understanding of the importance of medication adherence, diet, and exercise in the management of hypertension. Additionally, they were more aware of the complications of hypertension, how to recognize them, and when to seek medical attention. Time spent with the pharmacist reviewing home blood pressure readings and relating them to personal triggers may have positively impacted the patient's knowledge about hypertension and ability to retain information about management of the condition. Although medication adherence rates did not significantly improve, several studies have documented that knowledge deficits relating to hypertension often play a role in reduced medication adherence and worse blood pressure control.²²⁻²⁴ However, changes in adherence with educational efforts have historically been difficult to demonstrate.^{16, 25}

Limitations

A key limitation to this report that deserves discussion is that the duration was 4 visits or 6 months in length. This time frame was potentially inconsistent between patients due to

scheduling changes that caused deviations from the 6-week recurring appointment schedule. Six months was likely adequate to see some change in blood pressure but may not have been long enough to see changes in cardiovascular risk factors such as BMI or smoking status. Assessing patient satisfaction with the pharmacy service only at the end of the study period did not allow for conclusions regarding a change in patient's perceptions because of the service, but only their willingness to recommend the pharmacy service to others. Patients were not followed after the completion of the four visits so it is unknown if the positive effects seen on blood pressure or hypertension knowledge would persist over time. An additional limitation is that the \$50 payment from Wellness Warriors at the completion of 4 visits may have incentivized attending visits but not actively working toward improved health. Finally, the non-inclusion of a matched control group, lack of baseline satisfaction data for comparative purposes, and moderate number of patients achieving goal following the intervention, suggest that a rigorous clinical study may provide additional valuable evidence of results that began to emerge during this local implementation.

Conclusion

This pharmacy hypertension service resulted in improved blood pressure control in patients who were not at their treatment goal. All patients demonstrated an increase in their knowledge about hypertension and its treatment and expressed high satisfaction with the pharmacy service. As demonstrated here and in the recent study by Magolis published in JAMA¹⁸, the use of home blood pressure monitoring devices that can transmit information to pharmacists and the integration of reports based on this information into the routine patient care services can support pharmacists as they help patients reach and maintain blood pressure goals.

References

1. Lloyd-Jones D, Adams RJ, Brown TM, et al. on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics 2010 update: a report from the American Heart Association. *Circulation*. 2010;121:e46–e215.
2. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension*. 2003;42:1206–1252.

3. Ostchega Y, Yoon SS, Hughes J, Louis T. *Hypertension awareness, treatment, and control continued disparities in adults: United States, 2005–2006*. Hyattsville, MD: National Center for Health Statistics; 2008.NCHS Data Brief No. 3.
4. Flack JM. Epidemiology and unmet needs in hypertension. *J Manag Care Pharm*. 2007;13(8)(Suppl S-b):S2-S8.
5. Hill MN, Miller NH, DeGeest S on behalf of the American Society of Hypertension Writing Group. ASH Position Paper: Adherence and persistence with taking medication to control high blood pressure. *J Am Soc Hyperten*. 2011;5:56-63.
6. Pharmaceutical Care Services and Results in Project ImPACT: Hyperlipidemia. *J Am Pharm Assoc*. 2000 Mar-Apr;40:157–65.
7. Regional Osteoporosis Screening, Referral, and Monitoring Program in Community Pharmacies: Findings from Project ImPACT: Osteoporosis. *J Am Pharm Assoc*. 2004 Mar-Apr;44:152–160.
8. Patient Self-Management Program for Diabetes: First-Year Clinical Humanistic and Economic Outcomes. *J Am Pharm Assoc*. 2005 Mar-Apr;45:130-137.
9. The Asheville Project: Long-Term Clinical, Humanistic and Economic Outcomes of a Community-Based Medication Therapy Management Program for Asthma. *J Am Pharm Assoc*. 2006 Mar-Apr;46:133–47.
10. The Asheville Project: Clinical and Economic Outcomes of a Community-Based Long-Term Medication Therapy Management Program for Hypertension and Dyslipidemia. *J Am Pharm Assoc*. 2008 Jan-Feb;48:23–31.
11. The Diabetes Ten City Challenge: Interim Clinical and Humanistic Outcomes of a Multisite Community Pharmacy Diabetes Care Program. *J Am Pharm Assoc*. 2008 Mar-Apr;48:181–90.
12. The Diabetes Ten City Challenge: Final Economic and Clinical Results. *J Am Pharm Assoc*. 2009 May-Jun;49:e52-e60.
13. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC 7) Express. National Heart, Lung, and Blood Institute. Bethesda, Md. 2003. *JAMA*. 2003;289:2560–71.
14. McKenney JM, Slining JM, Henderson HR, et al. The effect of clinical pharmacy services on patients with essential hypertension. *Circulation*. 1973;48:1104-1111.
15. Santschi V, Chiolero A, Burnand B, et al. Impact of pharmacist care in the management of cardiovascular disease risk factors. *Arch Intern Med*. 2011;171:1441-1453.
16. Evans CD, Watson E, Eurich DT, et al. Diabetes and cardiovascular disease interventions by community pharmacists: A systematic review. *Ann Pharmacother*. 2011;45:615-628.
17. Green BB, Cook AJ, Ralston JD, et al. Effectiveness of home blood pressure monitoring, Web communication, and pharmacist care on hypertension control: a randomized controlled trial. *J Am Med Assoc*. 2008 Jun 25;299(24):2857-67.
18. Margolis KL, Asche SE, Bergdall AR, et al. Effect of home blood pressure telemonitoring and pharmacist management on blood pressure control. *J Am Med Assoc*. 2013;310(1):46-56.
19. Bunting BA, Smith BH, Sutherland SE. The Asheville project: Clinical and economic outcomes of a community-based long-term medication therapy management program for hypertension and dyslipidemia. *JAPhA* 2008;48:23-31.
20. Robinson JD, Segal R, Lopez LM, Doty RE. Impact of a pharmaceutical care intervention on blood pressure control in a chain pharmacy practice. *Ann Pharmacother*. 2010;44:88-96.
21. Earl GL, Henstenburg JA. Dietary approaches to hypertension: A call to pharmacists to promote lifestyle changes. *J Am Pharm Assoc*. 2012;52:637-645.
22. Petrella RJ, Campbell NR. Awareness and misconception of hypertension in Canada: results of a national survey. *Can J Cardiol*. 2005;21:589-93.
23. Han HR, Kim KB, Kang J, Jeong S, Kim EY, Kim MT. Knowledge, beliefs, and behaviors about hypertension control among middle-aged Korean Americans with hypertension. *J Community Health*. 2007;32:324-42.
24. Egan BM, Lackland DT, Cutler NE. Awareness, knowledge, and attitudes of older Americans about high blood pressure: implications for health care policy, education, and research. *Arch Intern Med*. 2003;163:681-7.
25. Wentzlaff DM, Carter BL, Ardery G, et al. Sustained blood pressure control following discontinuation of a pharmacist intervention. *J Clin Hypertens*. 2011;13:431-437.

Table 1: Visit activities

Visit	Hypertension Knowledge Survey	Review of Home Blood Pressure Readings	Visit Encounter Form	Education Provided	Identify and address medication related problems	Perception of Pharmacist's Care
1	X		X	X	X	
2		X	X	X	X	
3		X	X	X	X	
4	X	X	X	X	X	X

Table 2: Baseline Characteristics

	All participants (n=152)	Not at goal at baseline (n=62)
Age (years)	51.3 ± 8.9	51.3 ± 8.1
% Male	29.6%	32.3%
BMI	33.4 ± 8.6 (n=143)	34.0 ± 7.5 (n = 58)
Race (ethnicity)		
- African American	44.7%	54.8%
- Caucasian	40.1%	37.1%
- Asian/Pacific Islander	5.3%	4.8%
- Hispanic	1.3%	0.0%
- Not Specified	8.6%	3.2%
% Smokers	7.9%	4.8%
Blood pressure goal		
- % <140/90	81.6%	61.3%
- % <130/80	17.8%	37.1%
Total number of visits	3.8 ± 0.6	3.7 ± 0.7
Average time for first visit (minutes)	52.0 ± 12.0	53.5 ± 10.9
Average time for follow-up visits (minutes)	27.8 ± 11.4	28.4 ± 12.5
Baseline systolic blood pressure (mmHg)	132.3 ± 19.7	148.2 ± 18.6
Baseline diastolic blood pressure (mmHg)	83.4 ± 11.2	92.2 ± 9.4
Baseline % adherent to therapy	82.2%	86.6%
Baseline % with goals		
- Nutrition	76.3%	75.8%
- Exercise	84.9%	80.6%
- Weight	80.9%	85.5%

Table 3: Primary and Secondary Outcomes for all participants (n=152, unless otherwise indicated)

	Baseline	End of follow-up	Change	P value
Primary Outcomes				
% at blood pressure goal	59.2%	55.9%	-3.3%	P=0.19
Mean systolic blood pressure \pm SD (mmHg)	132.3 (19.7)	131.5 (16.6)	-0.8 (15.2)	P=0.25
Mean diastolic blood pressure \pm SD (mmHg)	83.4 (11.2)	82.6 (10.0)	-0.8 (8.6)	P=0.14
Secondary Outcomes				
% with nutrition goals	76.3%	78.3%	+2.0%	P=0.34
% with exercise goals	84.9%	80.9%	-4.0%	P=0.16
% with weight goals	80.9%	75.0%	-5.9%	P=0.09
% adherent (n=131)	93.4%	97.4%	+4.0%	P<0.05
% smoker	7.2%	6.6%	-0.6%	P=0.28
BMI (n=125)	33.4	33.6	+0.2	P=0.08

Table 4: Patient Perceptions of Disease State Knowledge

Question	Agree* at Baseline, n(%)	Agree* Post, n(%)	P value
My overall health is good.	75 (61.0)	89 (72.4)	P=0.06
Overall, it is important to take my blood pressure medications.	99 (84.6)	112 (97.4)	P<0.001
I feel well informed about my diagnosis of high blood pressure.	71 (59.2)	115 (95.8)	P<0.001
A healthy diet and exercise are necessary in managing my high blood pressure.	108 (87.8)	123 (100)	P<0.001
I know my blood pressure goals.	68 (59.1)	123 (100)	P<0.001
I know the signs and symptoms of a stroke.	72 (62.1)	116 (94.3)	P<0.001
I know the signs and symptoms of a heart attack.	84 (71.8)	117 (95.1)	P<0.001
I know what to do if I experience the signs or symptoms of a stroke or heart attack.	63 (53.8)	110 (89.4)	P<0.001

Pre and post surveys were available for 123 participants. Not all surveys were complete.

*Agree = 'Agree' or 'Strongly Agree' on 5 point Likert scale, or yes for "yes/no" question.

Table 5: Subgroup of Patients not at BP Goal at Baseline

	Baseline	End of follow-up	Change	P value
<i>Patients not at goal at baseline (n=62)</i>				
% at blood pressure goal	0%	21.0%	+21.0%	P<0.001
Mean systolic blood pressure \pm SD (mmHg)	148.2 (18.6)	141.0 (17.0)	-7.3 (16.5)	P<0.001
Mean diastolic blood pressure \pm SD (mmHg)	92.2 (9.4)	87.8 (9.4)	-4.4 (8.5)	P<0.001