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Evaluation of a Pharmacists' Patient Care Process Approach for Hypertension

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Abstract

Introduction: An estimated 116 million American adults (47.3%) have hypertension. Most adults with hypertension do not have it controlled—3 in 4 (92.1 million) U.S. adults with hypertension have a blood pressure ≥130/80 mmHg. The Pharmacists' Patient Care Process is a standardized patient-centered approach to the provision of pharmacist care that is done in collaboration with other healthcare providers. Through the Michigan Medicine Hypertension Pharmacists' Program, pharmacists use the Pharmacists' Patient Care Process to provide hypertension management services in collaboration with physicians in primary care and community pharmacy settings. In 2019, the impact of Michigan Medicine Hypertension Pharmacists' Program patient participation on blood pressure control was evaluated.

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Methods: Propensity scoring was used to match patients in the intervention group with patients in the comparison group and regression analyses were then conducted to compare the 2 groups on key patient outcomes. Negative binomial regression was used to examine the number of days with blood pressure under control. The findings presented in this brief are part of a larger multimethod evaluation.

Results: More patients in the intervention group than in the comparison group achieved blood pressure control at 3 months (66.3% vs 42.4%) and 6 months (69.1% vs 56.5%). The intervention group experienced more days with blood pressure under control within a 3-month (18.6 vs 9.5 days) and 6-month period (57.0 vs 37.4 days) than the comparison group did.

Conclusions: Findings support the effectiveness of the Michigan Medicine Hypertension Pharmacists' Program approach to implementing the Pharmacists' Patient Care Process to improve blood pressure control.

INTRODUCTION

An estimated 116 million U.S. adults (47.3%) have hypertension and most (92.1 million) do not have it controlled.[1] Including pharmacists in team-based care can improve long-term blood pressure (BP) control.[2,3] The Pharmacists' Patient Care Process (PPCP), endorsed by the Joint Commission of Pharmacy Practitioners,[4] is a standardized patient-centered approach to the provision of pharmacist care in collaboration with other healthcare providers.[5] The Michigan Medicine Hypertension Pharmacists' Program (MMHPP) is a PPCP-based intervention engaging health system and community-based pharmacists to manage high BP (defined by the MMHPP as ≥140/90 mmHg). MMHPP pharmacists provide hypertension management services in collaboration with physicians in primary care and community pharmacy settings. Pharmacists provide patient education, reinforce medication adherence, and initiate and adjust doses of hypertension medications.[6,7] This study seeks to assess the effectiveness of the MMHPP for BP control in ambulatory care settings.

METHODS

Deidentified electronic health records were used to evaluate the effectiveness of MMHPP implementation of the PPCP.[8] Eligibility included *established* and *active patients*, defined as patients who: (1) were in the MMHPP hypertension registry from 2017 to 2018,[a] (2) had ≥1 visit in 2017 and 1 in 2018 with their primary care provider to check BP, and (3) had ≥1 elevated BP[1] reading during a primary care provider visit (before the initial pharmacist visit) in 2017−2018. Once eligible individuals were identified, the intervention and comparison groups were created based on criteria listed in Figure 1.

Assessed outcomes included the percentage of patients with BP under control and number of days a patient had BP under control within 3 months and 6 months. "BP under control" was defined using the Healthcare Effectiveness Data and Information Set definition[9] and

[a]MMHPP uses an internal Michigan Medicine Clinical Care Guideline to define uncontrolled blood pressure as a measurement ≥140/90 mm Hg for patients 18−59 years old with or without diabetes or CKD and 60−85 years old with diabetes or CKD; ≥150/90 mm Hg in patients 60−85 years old without diabetes or CKD.

Michigan Medicine input (MMHPP uses an internal Michigan Medicine Clinical Care Guideline to define *uncontrolled blood pressure* as a measurement ≥140/90 mmHg for patients aged 18−59 years with or without diabetes or chronic kidney disease). At baseline, all individuals in the intervention and comparison groups had uncontrolled BP. The number of days with BP under control was calculated by counting the number of days between a BP reading that was under control and the next reading that showed BP uncontrolled. Patients who only had the baseline BP reading available, or no BP readings under control, were counted as having 0 days with BP under control.

Using propensity scoring, each patient in the intervention group was matched with one individual in the comparison group. Demographics, insurance status, and 2 clinical status measures (diabetes and chronic kidney disease diagnosis) were used in prosperity scoring to match individuals in the two groups (Table 1).

Logistic regression was conducted to examine statistical differences between the intervention and comparison groups in percentage of patients with BP under control. Negative binomial regression was conducted to examine the number of days with BP under control because the data were skewed toward 0 because many patients had few or no days with controlled BP.

A Centers for Disease Control and Prevention human subjects review and the RTI IRB each determined that the evaluation did not constitute human subjects research and, therefore, did not require full review.

RESULTS

The number of patients (n=2,161) and mean age (57 years) were the same for the intervention and comparison groups. Most patients in both groups were White (67% intervention, 72% comparison) and insured (99%) (Table 1).

Examining BP control within 3 and 6 months, results showed that the intervention group was 2.67 (95% CI=2.36, 3.02, Wald chi-square=243.23, p<0.001) times more likely than the comparison group to achieve BP control within 3 months and 1.72 (95% CI=1.52, 1.95, Wald chi-square=72.73, p<0.001) times more likely to achieve BP control within 6 months.

Examining the mean number of days with BP under control between baseline, 3 months, and 6 months for the intervention and comparison groups (Table 2), the results showed that the expected log count for the number of days with BP under control was 0.67 days higher for the intervention group (SE=0.09, 95% CI=0.49, 0.85) than for the comparison group when examining a 3-month period (Wald chi-square=59.5, p<0.001) and 0.42 days (SE=0.06, 95% CI=0.30, 0.54) higher than the comparison group for a 6-month period (Wald chi-square=42.6, p<0.001).

DISCUSSION

Consistent with other studies, findings suggest that team-based BP management approaches that include pharmacists such as the MMHPP can improve long-term BP control.[2,3] One

reason may be more frequent healthcare contact, because pharmacists continue to see referred patients until 2 consecutive normal BP readings are achieved. More intervention group patients, who received more frequent healthcare contact through a pharmacist, achieved BP control within 3 months and the number achieving BP control continued to increase at 3−6 months. Overall, findings suggest that controlled BP was achieved sooner and for more patients who received the MMHPP intervention.

Participation in PPCP also resulted in more days with BP under control within 3 and 6 months. Reducing the number of people with uncontrolled BP can result in fewer health-related events (e.g., heart attack, stroke) and lower healthcare costs.[10,11] These findings demonstrate the effectiveness of MMHPP implementation of the PPCP model in an ambulatory care setting and are consistent with other studies showing a positive impact of the provider−pharmacist team approach on outcomes related to BP management.[2,3,11,12] Future evaluations may examine patient perspectives regarding care from a provider−pharmacist team and whether patients managed by pharmacists are more likely to engage in routine BP checkups, have adequate medication plans, or adhere to hypertension medication regimens and recommended lifestyle changes.

Limitations

The evaluation was subject to several limitations. The electronic health record data were observational and did not allow for: (1) BP measurements at standard intervals for all patients; (2) hypertension indicators, such as the number of days a patient maintained BP control after completing the program; (3) reasons patients received or did not receive the intervention; (4) the point at which patients entered or exited the program; and (5) the inclusion of BMI data. Intervention patients likely had more frequent BP assessments and, in turn, the count of days under control may have been more precise. Dissimilarities in BP measurement and medication regimens between clinical and community pharmacy settings may have also contributed to observed differences. Finally, although patients were not randomized to an intervention, a commonly used and modern causal inference approach was implemented to make the groups comparable.

CONCLUSIONS

Because treatment of hypertension frequently involves combining a medication regimen and lifestyle changes, integrating pharmacists within care teams can support patients in managing BP. This evaluation examined the impact of MMHPP implementation of the PPCP in 1 health system that engaged both health system and community-based pharmacists and found support for the positive role pharmacists can play in BP control. Health systems with clinical pharmacists, or who partner with community pharmacies, might consider engaging them in patient BP management.

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REFERENCES

1. Hypertension cascade: hypertension prevalence, treatment and control estimates among U.S. adults aged 18 years and older applying the criteria from the American College of Cardiology and American Heart Association's 2017 Hypertension guideline−NHANES 2015−2018. Centers for Disease Control and Prevention (CDC); Updated March 22, 2021. https://millionhearts.hhs.gov/data-reports/hypertension-prevalence.html. Accessed May 7, 2021.
2. Community Preventive Services Task Force. Team-based care to improve blood pressure control: recommendation of the Community Preventive Services Task Force. Am J Prev Med. 2014;47(1):100–102. 10.1016/j.amepre.2014.03.003. [PubMed: 24933493]
3. Hwang AY, Gums TH, Gums JG. The benefits of physician-pharmacist collaboration. J Fam Pract. 2017;66(12):E1–E8. https://cdn.mdedge.com/files/s3fs-public/Document/December-2017/JFP06612e1.PDF. Accessed May 17, 2021.
4. Joint Commission of Pharmacy Practitioners. The Pharmacists' Patient Care Process. Joint Commission of Pharmacy Practitioners. https://jcpp.net/wp-content/uploads/2016/03/PatientCareProcess-with-supportingorganizations.pdf. Published May 29, 2014. Accessed May 17, 2021.
5. Centers for Disease Control and Prevention, HHS. Using the Pharmacists' Patient Care Process to manage high blood pressure: a resource guide for pharmacists. Atlanta, GA: Centers for Disease Control and Prevention, HHS; Published 2016. https://www.cdc.gov/dhdsp/pubs/docs/pharmacist-resource-guide.pdf.
6. Choe HM, Farris KB, Stevenson JG, et al. Patient-centered medical home: developing, expanding and sustaining a role for pharmacists. Am J Health Syst Pharm. 2012;69(12):1063–1071. 10.2146/ajhp110470. [PubMed: 22644984]
7. Centers for Disease Control and Prevention HHS. The pharmacists' patient care process approach: an implementation guide for public health practitioners based on the Michigan Medicine Hypertension Pharmacists Program. Atlanta, GA: Centers for Disease Control and Prevention, HHS. Published 2021; 2021. https://www.cdc.gov/dhdsp/evaluation_resources/guides/pharmacists_patient_care.htm. Accessed September 13, 2021.
8. Spencer LM, Schooley MW, Anderson LA, et al. Seeking best practices: a conceptual framework for planning and improving evidence-based practices. Prev Chronic Dis. 2013;10:E207. 10.5888/pcd10.130186. [PubMed: 24331280]
9. National Committee for Quality Assurance. Controlling high blood-pressure (CBP). Washington, DC: National Committee for Quality Assurance. https://www.ncqa.org/hedis/measures/controlling-high-blood-pressure/. Published 2020. Accessed June 10, 2020.
10. Overwyk KJ, Dehmer SP, Roy K, et al. Modeling the health and budgetary impacts of a team-based hypertension care intervention that includes pharmacists. Med Care. 2019;57(11):882–889. 10.1097/MLR.0000000000001213. [PubMed: 31567863]
11. Santschi V, Chiolero A, Colosimo AL, et al. Improving blood pressure control through pharmacist interventions: a meta-analysis of randomized controlled trials. J Am Heart Assoc. 2014;3(2):e000718. 10.1161/JAHA.113.000718.
12. Gums TH, Uribe L, Vander Weg MW, James P, Coffey C, Carter BL. Pharmacist intervention for blood pressure control: medication intensification and adherence. J Am Soc Hypertens. 2015;9(7):569–578. 10.1016/j.jash.2015.05.005. [PubMed: 26077795]

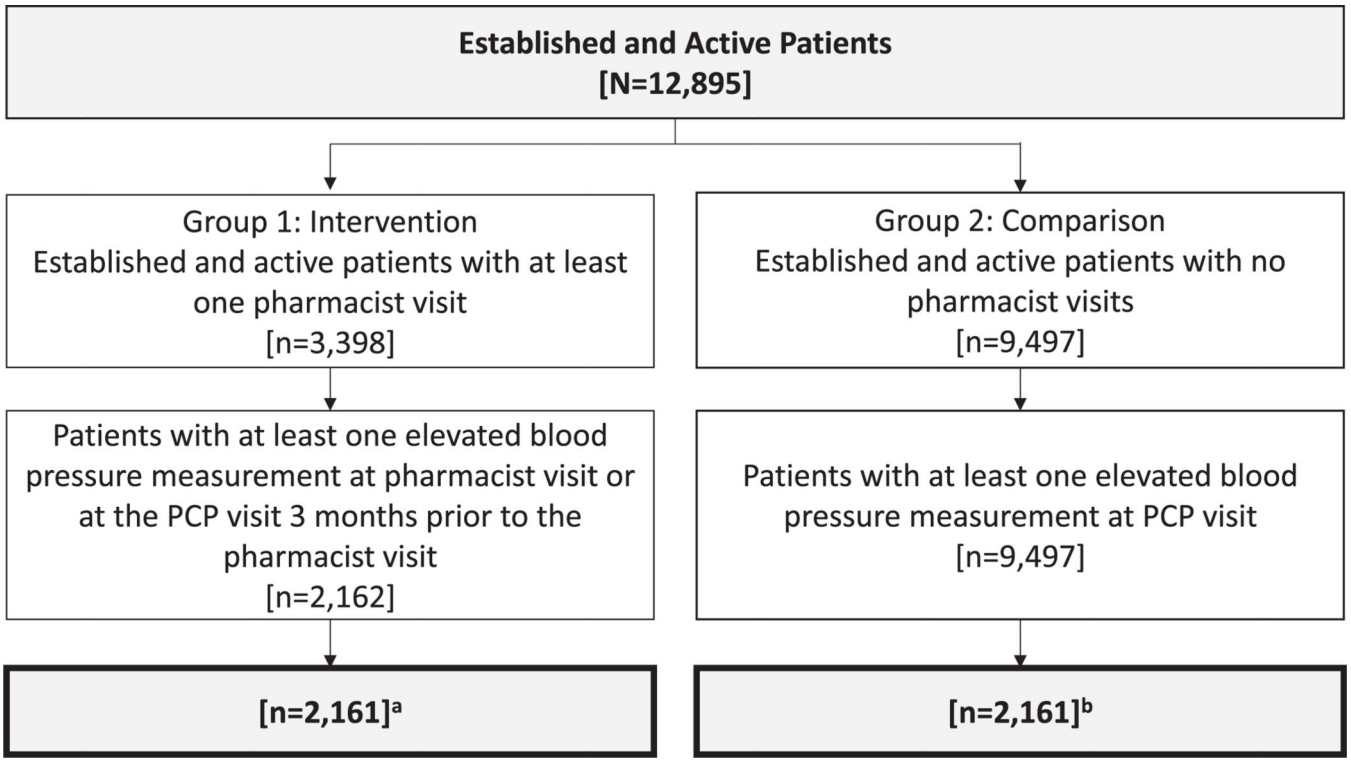

Figure 1.

Creation of intervention and comparison groups.

[a]One patient was excluded because they had missing race.

[b]Based on propensity score matching.

PCP, primary care provider.

Table 1.

Distribution of Demographics, Insurance, and Disease Characteristics Among the Matched Comparison and Intervention Groups

Variables	Comparison group *n*=2,161	Intervention group *n*=2,161
Age,[a] mean (SD)	57.3 (12.4)	57.3 (12.8)
Sex		
Male	971 (44.9)	1,009 (46.7)
Female	1,190 (55.1)	1,152 (53.3)
Race, *n* (%)		
White	1,547 (71.6)	1,436 (66.5)
Black	393 (18.2)	493 (22.8)
Asian	101 (4.7)	123 (5.7)
American Indian	7 (0.3)	1 (0.1)
Native Hawaiian	1 (0.1)	1 (0.1)
Other	50 (2.3)	61 (2.8)
Multiple selections[b]	26 (1.2)	28 (1.3)
Refused or unknown	36 (1.7)	18 (0.8)
Ethnicity, *n* (%)		
Hispanic	44 (2.0)	62 (2.9)
Non-Hispanic	1,944 (90.0)	1,889 (87.4)
Multiple selections[b]	115 (5.3)	52 (2.4)
Refused or unknown	58 (2.7)	158 (7.3)
Insurance,[c] *n* (%)		
Commercial	n/a[d] (58.7)	n/a[d] (58.0)
Medicare	n/a[d] (9.5)	n/a[d] (10.1)
Medicaid	n/a[d] (30.7)	n/a[d] (30.6)
Other	n/a[d] (0.1)	n/a[d] (0.2)
Insurance status unknown	n/a[d] (1.0)	n/a[d] (1.0)
Disease history, *n* (%)		
Diabetes	788 (36.5)	785 (36.3)
Chronic kidney disease	390 (18.1)	374 (17.3)

[a] Data set included variables for patient's age each month over 2 years; thus, age was calculated as the average age over 2 years.

[b] Data set included variables for patient's race each month over 2 years; some patients had inconsistent entries across 2 years. These patients were coded as multiple selections.

[c] Data set included variables for patient's insurance each month over 2 years; insurance status was calculated as percentage of time covered by various types of insurance over 2 years. For instance, over 2 years, those in the intervention group were covered by commercial insurance 58% of the time and by Medicaid 31% of the time. Similarly, those in the comparison group were covered by commercial insurance 59% of the time and by Medicaid 31% of the time.

[d]Because of methods used to calculate insurance status and, therefore, what the percentages represent, the *n* is nonreportable. Specifically, for this variable, *n* represents the number of months of data, which is equal to 24. As such, of the 24 months of insurance data available, on average, participants in the comparison group had commercial insurance 59% of the time and patients in the intervention group had commercial insurance 58% of the time.

n/a, not available.

Table 2.

Percentage and Number of Patients in Comparison and Intervention Groups With BP Under Control

Groups	Patients with BP uncontrolled at baseline	Patients with BP under control at 3 months after baseline[a]		Patients with BP under control at 6 months after baseline[a]		Number of days with BP under control at baseline Number of days	Number of days with BP under control at 3 months after baseline[b]		Number of days with BP under control at 6 months after baseline[b]	
	n (%)	*n* (%)	*p*-value	*n* (%)	*p*-value		Mean (SE)	*p*-Value	Mean (SE)	*p*-value
Comparison	2,161(100.0)	917 (42.4)	<0.001	1,221(56.5)	<0.001	0	9.51 (0.40)	<0.001	37.41 (1.06)	<0.001
Intervention	2,161(100.0)	1,433 (66.3)		1,493 (69.1)		0	18.61 (0.48)		56.96 (1.11)	

Note: Baseline BP for all patients was elevated according to HEDIS definition[9] and Michigan Medicine input.

[a]Difference between the intervention and comparison group based on logistic regression analysis.

[b]Difference between the intervention and comparison group based on the negative binomial analysis.

BP, blood pressure; HEDIS, Healthcare Effectiveness Data and Information Set.