Physician Acceptance of a Physician-Pharmacist Collaborative Treatment Model for Hypertension Management in Primary Care

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Physician-pharmacist collaborative care (PPCC) is effective in improving blood pressure (BP) control, but primary care provider (PCP) engagement in such models has not been well-studied. The authors analyzed data from PPCC referrals to 108 PCPs, for patients with uncontrolled hypertension, assessing the proportion of referral requests approved, disapproved, and not responded to, and reasons for disapproval. Of 2232 persons with uncontrolled hypertension, PPCC referral requests were sent for 1516 (67.9%): 950 (62.7%) were approved, 406 (26.8%) were disapproved, and 160 (10.6%) received no response. Approval rates differed widely by PCP with a median approval rate of 75% (interquartile range, 41%–100%). The most common reasons for disapproval were: PCP prefers to manage hypertension (19%), and BP controlled per PCP (18%); 8% of cases were considered too complex for PPCC. Provider acceptance of a PPCC hypertension clinic was generally high and sustained but varied widely among PCPs. No single reason for disapproval predominated. *J Clin Hypertens (Greenwich).* 2015;17:686–691. © 2015 Wiley Periodicals, Inc.

Hypertension affects an estimated 1 billion adults globally and is the leading preventable cause of death worldwide.[1,2] Population-level control of hypertension has improved in many countries in recent decades, yet control rates remain suboptimal worldwide.[3–6] Consequently, increased focus has been placed on health services research to identify cost-effective models to improve blood pressure (BP) control. One such model that is gaining increased attention in recent years is collaborative or team-based care where patients are managed by two or more providers from different disciplines (eg, a physician and pharmacist, or a physician and nurse). The addition of a pharmacist to the treatment team, in particular, has been shown to be broadly effective in reducing BP and improving BP control.[7–11] For example, in a cluster-randomized trial of 402 patients with uncontrolled hypertension at baseline, a physician-pharmacist collaborative care (PPCC) model resulted in greater than twice the control rate of standard care from a primary care physician (64% vs 30% control rates, respectively; $P<.001$) after 6 months of treatment.[7] Adjusting for baseline factors and medication adherence, the PPCC model was associated with 3.2 higher odds of achieving BP control compared with the standard care group.

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PPCC models have been most often employed using clinical pharmacists in the primary care setting where the majority of patients with hypertension are actively managed. Once patients are referred to such a model, physicians tend to have a very high (95%) level of agreement with pharmacist recommendations for hypertension management, particularly when the clinical pharmacist is housed within the primary care clinic.[12] However, the extent to which primary care providers (PCPs) participate with their patients in such models is not well established. Accordingly, we aimed to determine provider acceptance of a newly initiated PPCC hypertension clinic at two primary care clinics, each with a clinical pharmacist, as evidenced by approval rates of patient referral requests. In addition, we sought to identify the primary reasons for disapproval of patient referral requests. We hypothesized that acceptance of the PPCC model would be high and that acceptance would increase over time as providers gained familiarity with the service.

METHODS

Study Design

We performed a prospective study of PCP acceptance of a newly developed PPCC for the management of hypertension in the primary care setting. Briefly, the PPCC was designed as a specialty hypertension clinic housed within the primary care setting for patients with uncontrolled BP. Each of the two primary care clinics were academic-based internal medicine clinics. Patients referred to the PPCC clinic were scheduled for an initial visit with an academic clinical pharmacist where the pharmacist assessed BP, previous and current drug therapy, and dietary and exercise habits. The pharmacist

then developed an initial individualized treatment plan based on a BP treatment protocol that was modeled after the prevailing Joint National Committee Blood Pressure recommendations[13] and developed in collaboration with the clinic PCPs. The plan was then reported to the patient's PCP, revised as needed, and approved. When possible, PPCC encounters were conducted on days that the PCP was available in the clinic to allow real-time discussion of the plan between the PCP and pharmacist. Additional follow-up then occurred via subsequent clinic visits or via telephone encounters, as needed. At subsequent encounters, medication management was performed by the pharmacist under the approved treatment protocol. The degree and extent of physician-pharmacist collaboration for each patient was at the discretion of the PCP and pharmacist. While receiving care in the PPCC, patients continued to see their PCP for routine care, including BP management, as needed.

Monthly automated reports were generated in the electronic health record to identify all patients who met criteria for referral to the PPCC hypertension clinic. Inclusion criteria were age 18 to 89 years, uncontrolled BP defined as BP ≥140/90 mm Hg at the most recent primary care clinic visit and an average BP ≥140/90 mm Hg during the most recent three visits within the previous 18 months, and at least one primary care visit at one of the two study clinics within the past 12 months. The monthly reports were then manually reviewed and patients were excluded if their hypertension was actively managed (within the previous 6 months) by a non-PCP (eg, nephrologist, cardiologist). Patients were not excluded based on the presence of any specific comorbidities. For patients meeting the aforementioned criteria, an order for referral to the PPCC clinic was pended to the patient's respective PCP in the electronic health record, notifying the PCP that the patient had met the predefined criteria for management in the PPCC clinic; ≤10 referral requests were sent per provider per month. The provider could approve the referral, indicating agreement with the patient being treated in the PPCC clinic, or disapprove the referral, indicating that they preferred the patient not be treated in the PPCC clinic. Providers were instructed that they could disapprove patients for any reason. For all disapproved referrals, the PCP was asked to provide a rationale, using a free text response, for disapproving the referral. For nonresponsive providers, reminder notifications were sent at approximately 2 and 4 weeks after the initial referral was placed. The study was approved by the Colorado Multiple Institutional Review Board.

Data Collection

For patients meeting the aforementioned inclusion/exclusion criteria, data were collected from the electronic health record on all referrals placed for the PPCC clinic. These data included dates of referral placement and any subsequent reminders, PCP response (approval, disapproval, or nonresponse), and PCP rationale for disapprovals. Free text disapproval rationales were reviewed by study investigators and categorized by topic coding as one of the following: (1) hypertension being managed by a specialist (ie, cardiologist, nephrologist), (2) other care a priority, (3) patient case is too complex for PPCC, (4) patient currently controlled per PCP, (5) patient is new to the clinic (ie, lack of historical BP data), (6) patient is out of network or otherwise unable to come to appointments, (7) PCP prefers to manage hypertension themselves, (8) suspected or confirmed isolated clinic BP elevation (ie, "white-coat" hypertension), or (9) other rationale. For time trend data, we assessed what quarter of the year the referral request was originally placed to the PCP for hypertension management in the PPCC clinic (eg, quarter 1, quarter 2).

Outcomes

The primary outcome was the proportion of individual patient referrals for treatment in the PPCC hypertension clinic that were accepted by PCPs. Secondary outcomes included reasons for disapproval of patient referral requests.

Statistical Analyses

Descriptive statistics were used to characterize the study population and outcomes. Bivariate analyses comparing clinics were performed using the chi-square test. Comparisons within and between PCP type (ie, attending vs resident) were performed using nonparametric tests, including the Wilcoxon-Mann-Whitney and Kruskal-Willis tests; spearman correlation coefficients were used to assess the relationship between time in practice and approval rates among attending-level providers. Time trends in approval, disapproval, and nonresponse rates were analyzed using a generalized linear model. All analyses were performed using SAS 9.3 (SAS Institute, Cary, NC).

RESULTS

A total of 2232 patients with uncontrolled hypertension were identified from the monthly, automated reports between November 2012 and November 2013. After additional screening, 716 patients (32.1%) did not qualify for the following reasons: BP at most recent clinic visit (subsequent to screening report) was controlled (n=630; 88%); hypertension was managed by someone other than the PCP (n=75; 10.5%); or other (n=11; 1.5%). The remaining 1516 patients (67.9%) met inclusion criteria and all had referral requests sent to their respective providers (total=108). Approximately two thirds (n=1014) of these patients were cared for at the larger hospital-based academic clinic, whereas the remaining one third (n=502) were cared for at the smaller community-based academic clinic; however, the percentage of screened patients who qualified at each clinic were approximately equal (68.3% and 67.7%, respectively). Of the 108 PCPs who received at least one request, 56 (52%) were women and 45 (42%) were attendings, with a mean±standard deviation of

14.1±8.4 years in practice since completing a residency. The remaining 63 providers were residents; as of the end of the data collection period (November 2013), 21% were PGY1s, 33% were PGY2s, 22% were PGY3s, and 24% had completed their residency (ie, during the study period).

Approvals, Disapprovals, and Nonresponse

Of the 1516 referral requests submitted, any response was received for 1356 (89.4%), whereas no response was received for 160 (10.6%). Response rates differed modestly by clinic. We received any response from 90.8% of requests to providers at the larger hospital-based clinic vs 86.7% for requests to providers at the smaller community-based clinic (*P*=.012). Response rates also varied by individual provider, ranging from 0% to 100%. Among all 108 providers, the median response rate was 100% (interquartile range [IQR], 83.9%–100%) and the median number of referral requests sent per provider was six (IQR, 3–25.5). The number of referral requests per provider was considerably greater among attendings (median, 30 [IQR 17–40]) than residents (median, 3 [IQR 2–6]; *P*<.0001 comparing attendings vs residents), but response rates were not significantly different (96% vs 100%, respectively; *P*=.057).

Of the 1356 responses received, 950 (70.1%) were approvals and 406 (29.9%) were disapprovals. The percentage of responses approved was greater at the larger hospital-based academic clinic (73.5%) compared with the smaller community-based academic clinic (62.8%; *P*<.0001). Approvals also varied widely by provider: among all 108 providers, the proportion of requests approved among all requests sent ranged from 0% to 100% with a median approval rate of 75% (IQR, 41%–100%). Approval, disapproval, and nonresponse rates for all 108 providers are summarized in Figure 1. Because a significant number of providers were sent a small number of requests (ie, ≤5), approval rates were also analyzed using only those providers receiving ≥10 requests. Approval, disapproval, and nonresponse rates for these 43 providers are summarized in Figure S1. Among these same providers, the median approval rate was 70% (IQR 54%–89%).

No difference was observed in approval rates comparing attending PCPs (median approval rate, 59.5% [IQR 44.4%–78.3%]) and resident PCPs (71.4% [33.3%–100%]; *P*=.30). Among attending-level PCPs, we observed no significant correlation between years in practice (since completion of residency training) and percent of referral requests approved (ρ=.12; *P*=.45; Figure 2). Likewise, no difference in approval rates was observed comparing year of training (eg, PGY1–PGY3) for residents (*P*=.33).

Rationales for Disapproval

Of the 406 disapprovals received, rationales were provided for 244 requests (60.1%). Disapproval rationales are summarized in Figure 3. The most common stated reasons for disapproval were that the PCP preferred to manage the patients BP on their own (19%) and that the patient's hypertension was con-

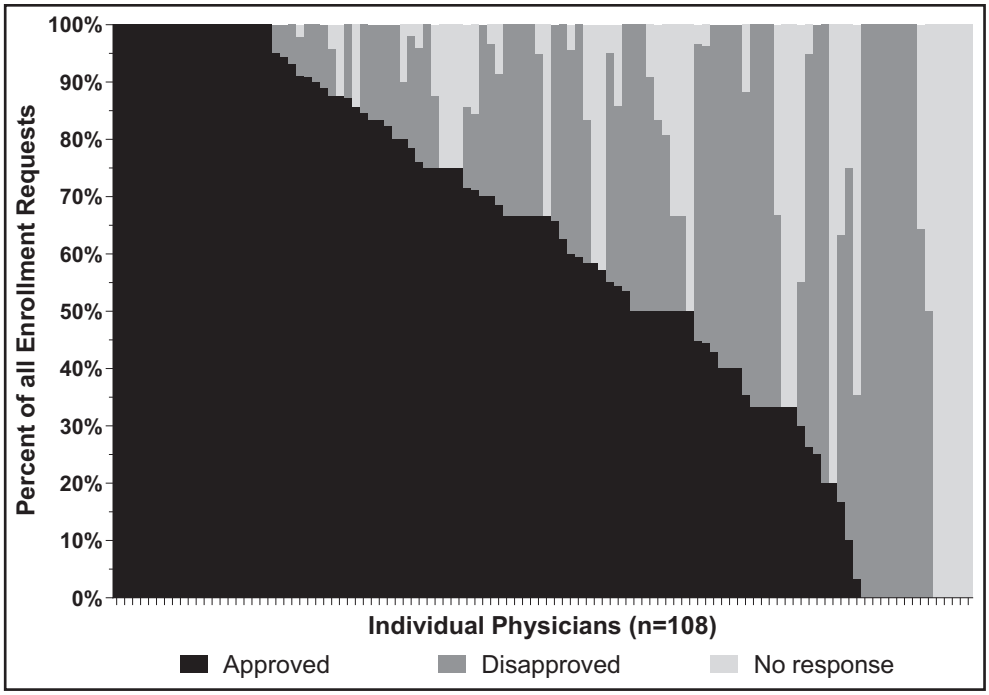

FIGURE 1. Approvals, disapprovals, and nonresponse by provider for all 108 providers.

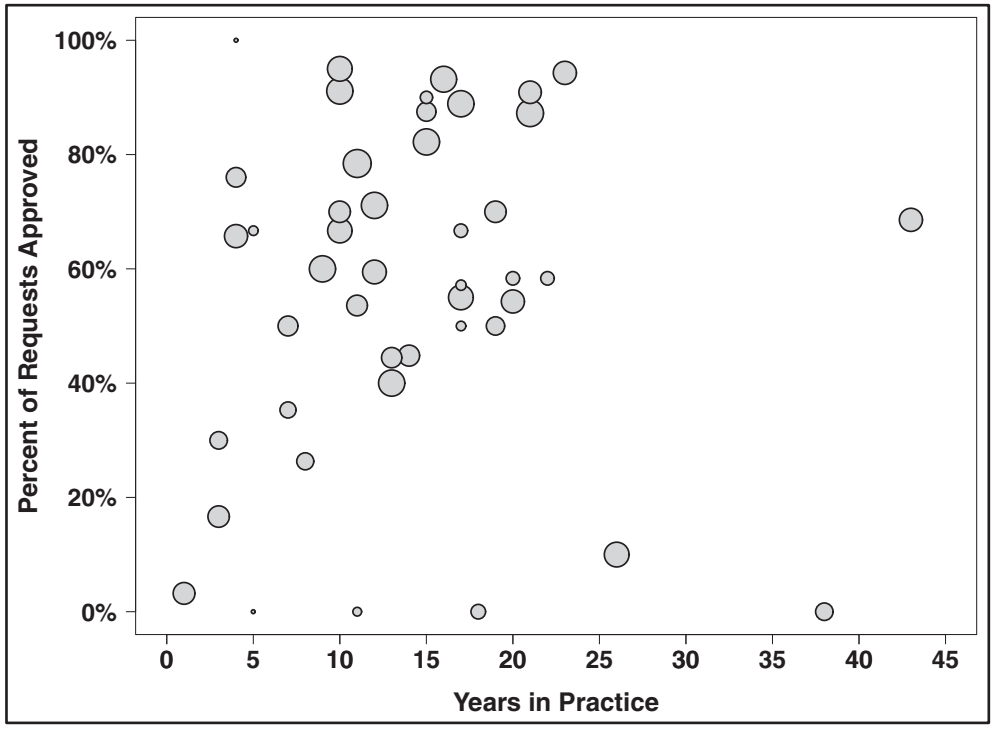

FIGURE 2. Percent of physician-pharmacist collaborative care clinic referrals approved among attending-level providers, according to years in practice. Data points are weighted according to the total number of referral requests sent, such that larger circles correspond to providers who received the greatest number of referral requests, whereas small circles represent those who received few requests.

trolled according to the PCP (eg, that a higher BP threshold for treatment was appropriate for the patient; 18%). Approximately one in 12 patients (8%) were considered too complex by their PCP to receive care in the PPCC hypertension clinic.

Time Trends in Approval, Disapproval, and Nonresponse

Considering all 1516 referral requests analyzed by quarter, approval rates ranged from 59.7% in quarter 1 to 57.3% in quarter 4, with the peak approval rate of 78.4% occurring in quarter 2 (Figure 4). No significant time trends were observed with regard to approval or disapproval rates. However, nonresponse increased modestly over time from 6% in the first quarter to 16% in the final quarter ($P<.0001$).

DISCUSSION

PPCC models are known to effectively reduce BP and improve BP control in patients with hypertension.[7,8] However, the extent to which the PPCC model is accepted by PCPs and patients has not been well described. In the present study, we explored acceptance of the PPCC model by PCPs and observed a relatively high level of engagement among more than 100 PCPs from two primary care clinics. To our knowledge, this is the first study to provide detailed data on approval and disapproval rates, and reasons for disapprovals, for patients qualifying for PPCC for hypertension in the primary care setting where PPCC models exist most frequently.

The limited previous research in this area has demonstrated that both physicians and pharmacists hold positive attitudes regarding future implementation of PPCC models, but that pharmacists generally consider such interventions more straightforward to implement than their physician colleagues.[14] Moreover, these positive attitudes generally hold true regardless of whether providers have had previous experience with PPCC models.[14] To our knowledge, qualitative studies have not assessed facilitators or barriers to provider referral of patients for collaborative hypertension treatment. However, some qualitative studies of PCP preferences for team-based hypertension care suggest that PCPs value several types of collaboration: PCP communication that include relaying information between the patient and PCP; assisting patients in overcoming barriers to adherence; tracking patient progress; engaging patients in disease self-management; and enhancing PCP's confidence in the accuracy of a hypertension diagnosis.[15–17] Our findings provide empirical support consistent with these previous data. Specifically, 95% of providers in the present study considered at least one of their patients acceptable for the PPCC hypertension clinic, suggesting that PCPs find a model of collaborative hypertension management led by a clinical pharmacist to be valuable in improving BP control in select patients. Furthermore, providers considered more than two thirds

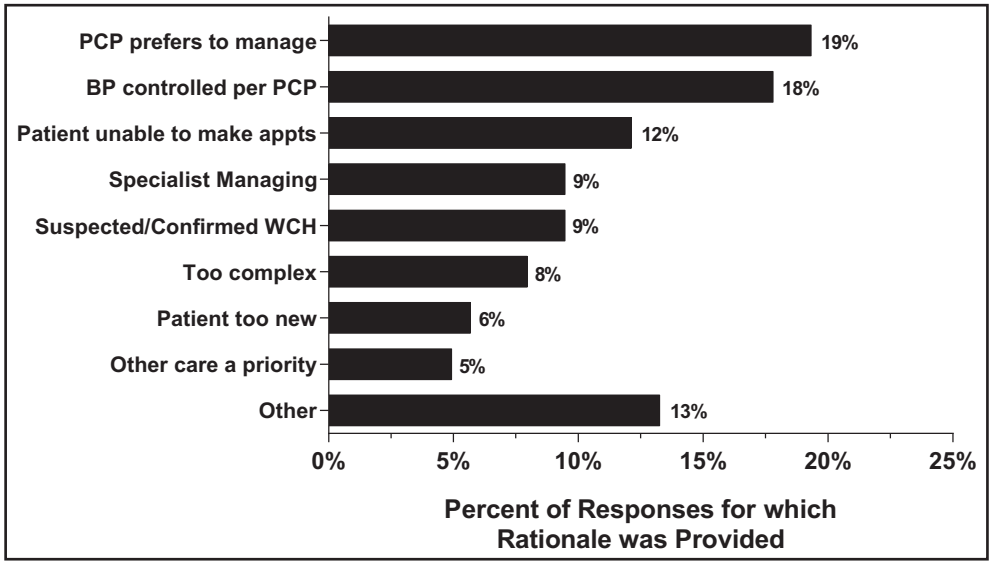

FIGURE 3. Provider rationales for disapproval from the PPCC hypertension clinic. Percentages represent the proportion of disapprovals with each respective rationale out of all disapprovals for which a rationale was provided (n=244). BP, blood pressure; PCP, primary care provider; WCH, white coat hypertension.

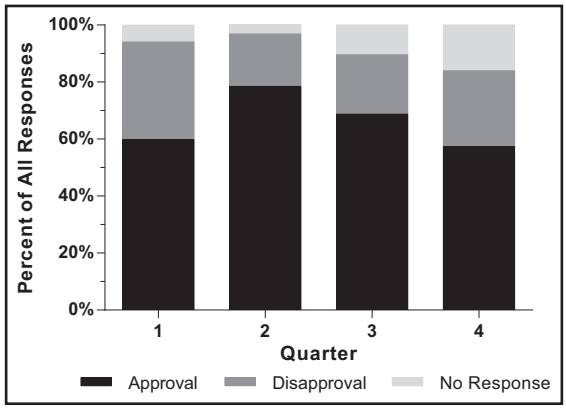

FIGURE 4. Approvals, disapprovals, and nonresponse over time.

of patients who met predefined criteria to be acceptable for a PPCC model of hypertension management. Of note, neither clinic included in this study had previous experience with this type of PPCC model prior to implementation of the hypertension clinic. We hypothesized that approvals would increase over time, as providers gained familiarity and confidence with the model. However, no such increase was observed, possibly because the time frame under study was too short. Finally, although most referral requests were sent to attending-level PCPs, we observed no difference in response rates or approval rates between attending and resident PCPs. Moreover, approval rates did not appear to be influenced by time in practice for either group of PCPs.

Rationales for disapproval into the PPCC hypertension clinic varied considerably, with no single rationale exceeding 20% of all provided rationales. The most common stated reason for disapproval was that the provider preferred to manage their patient's hypertension without the clinical pharmacist. Interestingly, 18% of disapprovals occurred when the PCP considered BP controlled, despite the patient having an elevated BP (≥140/90 mm Hg) at the most recent visit and a mean BP ≥140/90 mm Hg over the prior three visits. This finding could be due to several factors, including lack of trust in clinic BP validity,[18] provider disagreement with the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) criteria for BP goals,[13] or suspected white-coat hypertension that was not reported explicitly as such. Curiously, 8% of disapprovals were for patients considered "too complex," presumably the patients most likely to benefit from an interdisciplinary team-based care approach. Qualitative research to understand why certain PCPs prefer to manage hypertension on their own, especially in patients perceived as "overly complex," may help optimize future versions of the PPCC model for hypertension or other chronic diseases.

Although approval and disapproval rates remained relatively stable throughout the study year, nonresponse rates increased modestly over time. The total number of providers not responding to any requests was small (n=5; 4.6%) and all but one of these providers received five or fewer referral requests. The reasons for nonresponse among these providers are not known, but these providers may simply have been unfamiliar with the requests or what should be done with them. Alternatively, some providers may have considered collaborative care to worsen fragmentation of care

through the use of additional care providers, as has been documented in previous qualitative research.[15] Nevertheless, these data suggest a need for ongoing efforts to maintain provider engagement and to identify barriers and concerns of PCPs for referring patients to a collaborative care clinic.

LIMITATIONS

Our study has two limitations worth noting. First, we implemented one version of a PPCC model; therefore, alternative implementations of PPCC models for managing hypertension or other chronic diseases may result in different levels of engagement and acceptance. Thus, our results may not be generalizable to all implementations of a PPCC model or all settings given that these results reflect academic-based primary care clinics. However, we developed the PPCC model jointly with physician leadership and clinical pharmacist input, and the implementation described herein was designed to be flexible for each physician-pharmacist relationship in an attempt to increase generalizability. Finally, we encouraged, but did not require, providers to explicitly state rationales for disapprovals, and approximately one third of disapprovals were not accompanied by any rationale. We cannot say with any certainty whether the true rationales for these disapprovals mirrored those provided in the remaining two thirds of disapprovals.

CONCLUSIONS

These data suggest that, among our sample of 108 PCPs who were sent >1500 referrals, acceptance and engagement of a PPCC model was generally high and sustained for 1 year. Additional research is needed to identify common barriers to provider engagement and acceptance of PPCC models and to determine whether incorporating additional services into the PPCC model might improve provider uptake. For example, offering 24-hour ambulatory BP monitoring as part of the PPCC hypertension clinic[19] may reduce disapprovals on behalf of patients with suspected white-coat hypertension. In addition, patient perceptions of and engagement in PPCC models will need to be further explored in future studies.

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References

1. Kearney PM, Whelton M, Reynolds K, et al. Global burden of hypertension: analysis of worldwide data. *Lancet*. 2005;365:217–223.
2. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380:2095–2128.
3. Mancia G, Fagard R, Narkiewicz K, et al. 2013 ESH/ESC guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *Eur Heart J*. 2013;34:2159–2219.
4. Egan BM, Zhao Y, Axon RN. US trends in prevalence, awareness, treatment, and control of hypertension, 1988-2008. *JAMA*. 2010;303:2043–2050.
5. Wang J, Zhang L, Wang F, et al. Prevalence, awareness, treatment, and control of hypertension in China: results from a national survey. *Am J Hypertens*. 2014;27:1355–1361.
6. Falaschetti E, Mindell J, Knott C, Poulter N. Hypertension management in England: a serial cross-sectional study from 1994 to 2011. *Lancet*. 2014;383:1912–1919.
7. Carter BL, Ardery G, Dawson JD, et al. Physician and pharmacist collaboration to improve blood pressure control. *Arch Intern Med*. 2009;169:1996–2002.
8. Carter BL, Rogers M, Daly J, et al. The potency of team-based care interventions for hypertension: a meta-analysis. *Arch Intern Med*. 2009;169:1748–1755.
9. 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. *JAMA*. 2008;299:2857–2867.
10. Chen Z, Ernst ME, Ardery G, et al. Physician-pharmacist co-management and 24-hour blood pressure control. *J Clin Hypertens (Greenwich)*. 2013;15:337–343.
11. Weber CA, Ernst ME, Sezate GS, et al. Pharmacist-physician comanagement of hypertension and reduction in 24-hour ambulatory blood pressures. *Arch Intern Med*. 2010;170:1634–1639.
12. Carter BL, Bergus GR, Dawson JD, et al. A cluster randomized trial to evaluate physician/pharmacist collaboration to improve blood pressure control. *J Clin Hypertens (Greenwich)*. 2008;10:260–271.
13. Chobanian AV, Bakris GL, Black HR, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *JAMA*. 2003;289:2560–2572.
14. Demik DE, Vander Weg MW, Lundt ES, et al. Using theory to predict implementation of a physician-pharmacist collaborative intervention within a practice-based research network. *Res Social Adm Pharm*. 2013;9:719–730.
15. Hussain T, Allen A, Halbert J, et al. Provider perspectives on essential functions for care management in the collaborative treatment of hypertension: the P.A.R.T.N.E.R. framework. *J Gen Intern Med*. 2015;30:454–461.
16. Tobe SW, Moy Lum-Kwong M, Von Sychowski S, Kandukur K. Hypertension management initiative: qualitative results from implementing clinical practice guidelines in primary care through a facilitated practice program. *Can J Cardiol*. 2013;29:632–635.
17. Margolius D, Wong J, Goldman ML, et al. Delegating responsibility from clinicians to nonprofessional personnel: the example of hypertension control. *J Am Board Fam Med*. 2012;25:209–215.
18. Ray GM, Nawarskas JJ, Anderson JR. Blood pressure monitoring technique impacts hypertension treatment. *J Gen Intern Med*. 2012;27:623–629.
19. Ernst ME. Ambulatory blood pressure monitoring: recent evidence and clinical pharmacy applications. *Pharmacotherapy*. 2013;33:69–83.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Approvals, disapprovals, and nonresponse by provider for those providers receiving ≥10 referral requests during the study period.