A Brief, Multifaceted, Generic Intervention to Improve Blood Pressure Control and Reduce Disparities Had Little Effect

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Background: Poor blood pressure (BP) control and racial disparities therein may be a function of clinical inertia and ineffective communication about BP care.

Methods: We compared two different interventions (electronic medical record reminder for BP care (Reminder only, [RO]), and clinician training on BP care-related communication skills plus the reminder (Reminder + Training, [R+T]) with usual care in three primary care clinics, examining BP outcomes among 8,866 patients, and provider-patient communication and medication adherence among a subsample of 793.

Results: Clinician counseling improved most at R+T. BP improved overall; R+T had a small but significantly greater reduction in diastolic BP (DBP; -1.7 mm Hg). White patients at RO experienced greater overall improvements in BP control. Site and race disparities trends suggested that disparities decreased at R+T, either stayed the same or decreased at Control; and stayed the same or increased at RO.

Conclusions: More substantial or racial/ethnically tailored interventions are needed.
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Introduction

Hypertension affects more than 70 million Americans,[1] is more frequent among African Americans (AAs),[2] and accounts for a significant portion of racial differences in mortality.[3] Most patients with hypertension have poorly controlled blood pressure (BP), and AAs are disproportionately represented among this group,[4] with a higher prevalence of diastolic hypertension in younger, Black populations compared to the mostly systolic hypertension seen in the elderly.[5] Clinician failure to aggressively manage hypertension (ie, clinical inertia) is an issue,[6] but even with adequate management, 43%-78% of patients fail to adhere to recommended therapies,[7-9] and AAs may be less likely to adhere to prescribed hypertension therapies than Whites.[10,11]

There are likely multiple causal pathways to these disparities in adherence and BP outcomes,[12] suggesting several approaches to their reduction. In particular, prior evidence indicates that provider-patient communication affects adherence,[13,14] and poor communication contributes to worse care for racial/ethnic minority patients.[15,16] Computer-generated reminders and decision support improve clinician compliance with practice guidelines and may help address clinical inertia.[17] However, it is unknown whether general interventions to improve BP control can also reduce disparities; if a rising tide can lift all boats, then perhaps overall improvements will translate into reduced disparities. Since poor communication is a particular issue for AA patients, improvements in that group might lead to reduced disparities.

As the literature indicates that multi-faceted interventions to address BP control are most efficacious,[18-21] we evaluated the effectiveness of two provider-focused interventions to improve hypertension care and

outcomes: 1) an electronic medical record (EMR) reminder regarding hypertension care; and 2) a clinician-focused communication skills training intervention to improve communication with patients about BP and antihypertensive medication adherence. We posited that these interventions would lead to overall improvements in clinician communication with patients, improved medication adherence and BP outcomes for both Whites and AAs, and as a secondary outcome, hypothesized that such general improvements might decrease disparities in BP outcomes.

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Methods

Sites

We implemented a three-armed, before-after study with concurrent controls in the primary care clinics of three large Veterans Affairs (VA) medical centers (VAMCs) where the proportion of AA patients was higher than the national population average. Entire sites were randomly assigned to a study arm, so all clinics within each site's intervention condition were randomized to the same study condition. Eligible patients within each study site was 3,199 at one site, 3,869 at another, and 4,460 at the third. Because we were treating the site as a whole unit, and because the clinics were organized differently at each site, we did not match by clinic or track the number of patients within clinic units.

At one site, providers gave usual care (control), at another we implemented an EMR reminder regarding hypertension care in May, 2003 (Reminder only, [RO]), and at a third we implemented the EMR reminder and also taught clinicians to advise and counsel patients about medication adherence and hypertension care by using patient-centered counseling[22,23] (both implemented in May 2003; Reminder + Training, [R+T]). We gathered baseline BP data at each patient's first visit prior to the intervention (2/18/02-4/30/03) and obtained follow-up data on patients at their first visit subsequent to the intervention implementation, between 5/05/03-4/01/04. Approval for this research was obtained at the institutional review boards at each of the participating VAMCs.

EMR Reminder

The VA developed an EMR reminder for hypertension care,[24] which we selectively implemented at the two intervention sites. This reminder differed only in minor respects from the then-current relevant national guidelines (JNC-VI),[25] although the concurrent VA practice guidelines suggested the same, rather than stricter, BP thresholds for patients with diabetes as for all other patients.

The reminder was activated by the most recent BP readings in the electronic vital signs package within the EMR, and was turned on at the start of the intervention period for every patient at the two sites where the reminder was part of the intervention. There were two reminder versions depending on the patient's BP (one for patients with BP of 140/90 mm Hg to 159/99 mm Hg and another for patients with BP >160/100 mm Hg). Both also included a section on lifestyle counseling. For a provider to resolve the BP >140/90 mm Hg reminder, s/he had to electronically document at least one medication intervention (eg, adjustment) *or* at least one educational intervention (lifestyle counseling). The BP >160/100 mm Hg reminder required both such interventions. Alternatively, for both versions, the provider could resolve them by entering a new BP of <140/90 mm Hg, by providing rationale for no intervention (eg, medication nonadherence), or by noting that the hypertension diagnosis was in error.

Clinician Communication Skills Training Intervention

Because multi-component interventions to improve patient adherence and improve BP control are more successful than single strategy interventions,[18,19] we also implemented an additional communication skills training intervention for clinicians, using the evidence-based approach of patient-centered counseling (PCC) focused on enhancing communication regarding antihyper-

tensive medication adherence. Led by an experienced trainer, and following similar protocols used in other studies of PCC,[22,26,27] we conducted two one-hour training sessions for approximately half of the 29 primary care providers (ie, physicians, physician assistants, nurse practitioners, and clinical pharmacists) authorized to prescribe or titrate antihypertensive medications. Training included a didactic presentation, review and discussion of a summary algorithm of the suggested counseling steps, and role play to practice skills. We developed this training based on the patient-centered counseling method (sometimes referred to as the 4A's or 5A's), previously proven effective for use in other contexts requiring patient behavior change.[23,26,27] We implemented the same approach as used in prior PCC studies in terms of duration and content for provider training sessions and reminding providers to counsel. Thus, we taught providers to ask about patients' hypertension beliefs, and barriers to adherence and to advise patients by explaining what hypertension is, health problems that might develop with uncontrolled BP, and by specifically stating the importance of taking BP medications as prescribed. Then, providers were taught to assess patients' prior experiences in changing behaviors to identify barriers and facilitators to such change, and the level of motivation to do so. Next, providers were taught to assist patients in making needed changes, to provide written information about BP, to help patients develop methods for addressing barriers to adherence, and to agree to a follow up plan. Finally, providers were urged to address relapse, revisiting the prior steps as necessary. Because this counseling method is patient-centered, it is designed to be inherently sensitive to the needs of each individual patient, including cultural/racial/ethnic background and different beliefs about BP or barriers to taking BP medications. However, it was not culturally tailored, per se, in that separate counseling approaches were not designed for White vs African American patients.

In addition, because simply teaching a skill does not ensure its use, we implemented several components of an office-based support system to remind providers to counsel in addition to the hypertension EMR reminder. We posted a summary counseling algorithm in exam rooms and provided patient education materials for clinicians to distribute.

Study Participants

Using the national VA outpatient administrative file, we identified 11,528 White and AA patients with two separate diagnoses of hypertension in 2001, restricting the sample to patients with at least one post-intervention primary care visit, to ensure patient exposure to the intervention. This resulted in 8,866 patients.

To obtain data about counseling and adherence, we interviewed a sub-sample of patients. Staff tracked patients' primary care visits over 14 months, and as they presented for care, approached 1,210 of them to request participation in the study interview conducted around routine primary care visits – pre- and post-intervention. In all, 203 patients were excluded: race not AA or White (n=18); poor mental status (n=41); denying hypertension (n=59); participation in another hypertension study (n=6); and other reasons (n=79). This resulted in 1,007 eligible patients but 214 patients (18%) refused to participate. Thus, 793 patients were included in the interview sub-sample (79% response rate); we conducted follow-up interviews with 514 patients.

Measures

Patient Sociodemographic and Clinical Characteristics

We obtained information about height, weight (calculated body mass index), age and sex from the EMR. Using the VA Outpatient and Inpatient Files, we obtained diagnoses of benign prostatic hypertrophy (BPH), coronary artery disease (CAD), congestive heart failure, cerebrovascular disease, diabetes mellitus, hyperlipidemia, peripheral vascular disease, renal dysfunction or tobacco use because these conditions might influence management and outcomes of hypertension.

From the survey, we collected information about income, education completed, marital and employment status.

Outcome Assessment

Provider Counseling Behaviors

Following Ockene,[23] we assessed the content of the provider-patient interaction focusing on hypertension and antihypertensive medication adherence through an interview with each patient after his/her visit. Patient exit interviews (PEIs) accurately measure the actual content of clinic visits, validated through

comparisons of audiotapes of such interactions to patient reports,[28] and reflect the fidelity of the intervention by quantifying the extent to which providers actually counselled patients on the topics they were taught to counsel about in the provider training. The interview items have been detailed elsewhere;[11] they covered hypertension-related topics that the providers should have been trained to discuss during the visit: understanding of the disease; medication taking; adherence barriers and facilitators; and provision of written educational materials. Answers were summed to create a scale score (range: 1 to 12 with higher scores indicating more counseling). We used this variable as both an outcome and a covariate, depending on the analysis.

Antihypertensive Medication Adherence

Patients self-reported medication adherence, using items from two well-validated measures[29,30] from which we created a dichotomous variable indicating any adherence problems; this measure was previously validated against BP control.[11]

Blood Pressure

We used EMR BP information that had been collected by clinical staff as part of routine care. Baseline BP was the last BP prior to the date at which the intervention took place or began, and follow-up BP was the last BP taken on or after that date. We analyzed systolic BP (SBP) and diastolic BP (DBP) values as continuous measures. We also dichotomized BP values into two categories: controlled and not controlled (the latter being when either value exceeded 139/89 mm Hg).[25]

Data Analysis

We examined descriptive statistics for all variables, using t-tests or chi square analyses to examine differences across groups (site and race). We conducted a series of random effects least squares and logistic regression analyses accounting for clustering of patients-within-provider and providers-within-site by including provider-specific and site-specific random effects terms. In all regressions, time period was coded as a binary variable (pre- and post-intervention), and site was coded as two binary indicator variables, one indicating R+T vs control, and the other indicating RO vs control. To assess the impact of intervention on continuous DBP, SBP, and provider-counseling scores, we performed random effects least squares regression on the main effects and interaction of site with time period, adjusting for relevant covariates and baseline BP. The random effects for each patient and provider were assumed to be mean-zero and normally-distributed. The effects of the interaction between site indicators and time period were the intervention effects. To measure the intervention effect on the probability of whether a patient had high BP and probability of medication adherence, we fit random effects logistic regressions using the same covariates. We examined the racial difference in intervention effects in all the preceding regression models by including a race indicator (White vs AA) as a main effect along with its two- and three-way interaction with site and time period; the racial difference of the intervention effect was the coefficient of the three-way interaction in these models. The random effects least-squares regressions were implemented using the "lme" function in the statistics package R,[31] and the random effects logistic regressions were implemented using the "glmmPQL" function in R. Significance of the intervention effects and racial difference in intervention effects were tested using a Wald test assuming an approximately normally distributed test statistic.

We examined the effects of the intervention, and the interaction effects of the intervention with race, on BP among the full sample, using the control arm as the reference group. Separately, we replicated these analyses among the survey subsample, including the additional available data on clinician counseling and medication adherence as covariates. We also examined clinician counseling and adherence as outcomes among the subsample.

Finally, to examine the disparities in absolute trends of the BP values over time (not just a trend relative to the control site as in the above analyses), we computed unadjusted average BP values by race, site and baseline/follow-up period, examining the pattern of gaps between groups/time.

Results

Sociodemographic and Clinical Characteristics of the Sample

Among our sample of 8,866 hypertensive patients (98.8% male), the mean age was 66.2, 34.2% were White, and 42.4% were married (Table 1). Among the inter-

Table 1. Characteristics of the cohort

	N	Overall	AA [ab]	White	Control	R+T	RO
Race, % White	8866	34.2			13.3 [a]	36.8 [b]	54.9
Age, mean	8866	66.2	65.3 [a]	67.8 [b]	67.1 [a]	65.5 [b]	66.0 [b]
% male	8866	98.8	99.1 [a]	98.2 [b]	99.9 [a]	99.0 [b]	97.3
% married	8864	42.4	37.6 [a]	51.7 [b]	39.7 [a]	41.4 [a]	47.2 [b]
Income < $20K, % [c]	672 [c]	53.6	54.0 [a]	53.0 [a]	61.1 [a]	45.7 [b]	54.7 [a]
% Employed [c]	745 [c]	15.7	18.0 [a]	12.5 [b]	12.0 [a]	15.2 [ab]	19.8 [b]
High school education, % [c]	743 [c]	73.1	72.0 [a]	74.6 [a]	64.1 [a]	78.9 [b]	76.4 [b]
Pre , % adherent [c]	595 [c]	76.6	73.9 [a]	80.6 [a]	73.7 [a]	80.1 [a]	76.3 [a]
Post, % adherent [c]	405 [c]	85.2	80.3 [a]	92.2 [b]	84.3 [a]	85.7 [a]	85.5 [a]
Pre-BMI mean	8452	29.7	29.5 [a]	30.1 [b]	29.1 [a]	30.1 [b]	29.7
Post-BMI mean	8305	29.5	29.3 [a]	29.9 [b]	29.0 [a]	29.8 [b]	29.5
BPH, % yes	8866	30.1	31.9 [a]	26.6 [b]	46.8 [a]	18.8 [b]	26.9
CAD, % yes	8866	43.4	37.9 [a]	53.9 [b]	41.2 [a]	38.4 [b]	53.2
CHF, % yes	8866	20.9	21.1 [a]	20.6 [a]	23.9 [a]	17.8 [b]	21.9 [a]
CVD, % yes	8866	20.9	21.3 [a]	20.1 [a]	23.3 [a]	19.6 [b]	19.8 [b]
DM, % yes	8866	44.9	46.0 [a]	42.7 [b]	47.4 [a]	45.1 [a]	41.6 [b]
Lipid, % yes	8866	61.9	59.3 [a]	67.0 [b]	71.7 [a]	59.7 [b]	53.8
PVD, % yes	8866	22.2	22.3 [a]	22.1 [b]	31.1 [a]	18.9 [b]	16.5
Renal, % yes	8866	23.3	27.9 [a]	14.3 [b]	34.3 [a]	18.3 [b]	17.6 [b]
Tobacco, % yes	8866	18.1	19.6 [a]	15.2 [b]	21.3 [a]	12.0 [b]	23.2 [a]

Pre-BMI, body mass index calculated pre-intervention; post BMI, body mass index calculated post-intervention; BPH, benign prostatic hypertrophy; CAD, coronary artery disease; CHF, congestive heart failure; CVD, cerebrovascular disease; DM, diabetes; lipid, hyperlipidemia; PVD, peripheral vascular disease; renal, renal disease; tobacco, tobacco use.

a,b. The a,b footnotes adjacent to mean values for each group indicate that groups are significantly different from one another at P<.05; if the same superscript letter is present, the groups are not different from one another. For example, in the column for employed by site, since control and R+T both have superscript 'a's' next to their means, they are not different from one another; likewise, RO is not significantly different from R+T because they both have superscript b's next to their means. However, control is significantly different from RO because one has an 'a' and the other has a 'b.'

c. Variables available only from the survey subsample.

view sub-sample, 54% had incomes <$20,000, 16% were employed, and 73% had at least a high school education. AAs, who comprised 58% of the subsample, were younger, less often married, and more often employed. There was a high burden of comorbid conditions, and AAs had higher rates of BPH, diabetes, renal dysfunction and tobacco use, with lower BMIs, lower rates of CAD and hyperlipidemia, and similar baseline medication adherence.

There was a higher proportion of AAs at the control (87%) and R+T sites (63%) than the RO site (45% P<.05). Demographic and clinical differences by site in age, income, marital and employment status are summarized in Table 1; the characteristics of the patients at the control site reflect the high proportion of AAs and indicate worse status in most dimensions.

The control site had a significantly lower percentage of patients with uncontrolled BP at baseline (Table 2), with lower mean SBP and DBP. Among all patients at baseline, 57.5% had uncontrolled BP, with AAs having significantly higher rates (Table 2). Similarly, AAs had higher baseline mean SBPs, with higher baseline mean DBPs.

Provider Counseling

At baseline, we found no overall differences in counseling among the sites; however, at follow up, providers at R+T and RO provided more counseling than providers at control (6.5 and 6.7 vs 5.4 counseling behaviors, *P*<.05) (Table 2). Examining the intervention effect alone, providers at both R+T and RO also had greater increases in the number of counseling behaviors over time than at control (1.3 and 1.1 more counseling behaviors, *P*=.0056 and *P*=.0135, respectively; Table 3). Examining the simultaneous effects of the intervention and race, we found that providers performed about 2.2 more counseling behaviors from baseline to follow up for White patients relative to AA patients at RO compared with control *(P*=.0236; Table 3), with a trend in the same

Table 2. Dependent variables, overall and by race, site and time

	N	Overall	AA [ab]	White	Control	R+T	RO
SBP, mean							
Pre-intervention	8866	143.3	144.4 [a]	141.4 [b]	141.6 [a]	144.2 [b]	144.1 [b]
Post-intervention	8706	140.9	141.6 [a]	139.4 [b]	139.5 [a]	141.3 [b]	141.8 [b]
DBP, mean							
Pre- intervention	8866	76.4	77.7 [a]	73.7 [b]	75.3 [a]	77.4 [b]	76.2
Post-intervention	8706	75.2	76.6 [a]	72.5 [b]	74.9 [a]	75.4 [a]	75.1 [a]
% with uncontrolled BP							
Pre-intervention	8866	57.5	59.0 [a]	54.6 [b]	53.4 [a]	59.1 [b]	59.9 [b]
Post-intervention	8706	51.8	53.4 [a]	48.7 [b]	49.8 [a]	52.0 [ab]	53.8 [ab]
Clinician counseling (PEI mean score)							
Pre-intervention	682	6.3	6.6 [a]	5.8 [b]	6.3 [a]	6.1 [a]	6.5 [a]
Post-intervention	481	6.2	6.5 [a]	5.8 [a]	5.4 [a]	6.5 [b]	6.7 [b]
% Adherent							
Pre-intervention	595	76.6	73.9 [a]	80.6 [a]	73.7 [a]	80.1 [a]	76.3 [a]
Post-intervention	405	85.2	80.3 [a]	92.2 [b]	84.3 [a]	85.7 [a]	85.5 [a]

SBP, systolic BP; DBP, diastolic BP; high BP, uncontrolled BP >140/90 mm Hg.
a,b. The a,b footnotes adjacent to mean values for each group indicate that groups are significantly different from one another at P<.05; if the same superscript letter is present, the groups are not different from one another. For example, in the column for employed by site, since control and R+T both have superscript 'a's' next to their means, they are not different from one another; likewise, RO is not significantly different from R+T because they both have superscript b's next to their means. However, control is significantly different from RO because one has an 'a' and the other has a 'b.'

direction of 1.67 more counseling behaviors at R+T vs control *(P*<.11).

Medication Adherence

There were no differences in baseline adherence between groups (73.7 - 80.1% of patients adherent; Table 1); and nor were there differences between groups at follow up (84.3 - 85.7% adherent), although there was a 6-11 percentage point increase in adherence rates among the groups over time. Examining the intervention effect alone, patients at R+T reported less improvement over time in adherence than at control (-1.73, *P*=.0001, Table 3). There were no significant differences between the RO group and control. We examined the simultaneous effects of the intervention and race (adjusting for counseling), but because all White patients at control were adherent, the model examining racial differences in the intervention effect was inestimable.

Blood Pressure

All groups had a decrease in BP over time regardless of intervention (Table 2). In analyses of the intervention effect only, there was a greater decrease in mean DBP over time at R+T than at control (-1.73 mm Hg, P<.0001) and a trend of a greater decrease over time at RO compared with control (-.70 mm Hg, P=.0626) (Table 4). Also, the percentage of patients with uncontrolled BP decreased more over time at R+T relative to control (-.14; P=.0514), with a similar, non-significant, pattern for RO vs control (-.11; P=.15). In analyses examining the simultaneous effects of race and intervention, Whites' rates of uncontrolled BP decreased more than AAs at RO relative to a similar comparison between Whites and AAs at Control (-.51; P=.0072), but no other significant effects of race and intervention were observed.

Additional analyses among the survey sub-sample including the clinician counseling and adherence information as covariates yielded

Table 3. Intervention effect and racial difference in intervention effect on physician counseling and medication adherence among survey participants

		Clinician Counseling (PEI) [a]	Adherence [a]
Intervention effect (ref group = control site)	R+T	1.33 (.48) .01	-1.73 (.44) .00
	RO	1.11 (.45) .01	-.34 (.40) .39
Racial difference in intervention effect (ref group = racial difference at control site)	R+T	1.67 (1.04) .11	Inestimable
	RO	2.24 (.98) .02	Inestimable

a. Variables included in the model are age, race, marital status, sex, employment status, income, education, BMI, comorbid conditions as in Table 1, tobacco use, time and site.

somewhat different results; patients at R+T experienced a trend of a greater drop in SBP (-4.9 mm Hg, P=.0848) and significantly greater decreases in uncontrolled BP compared to Control (-1.13, P=.0015), with greater decreases in uncontrolled BP among patients at RO as well (-.62, P=.0489). Notably, in this sub-sample, once clinician counseling and medication adherence were included in the models, no racial differences remained in intervention effects.

Discussion

Our effort to reduce disparities and improve counseling regarding hypertension care, medication adherence and BP outcomes increased clinician counseling, with the greatest increases from the most intensive intervention and strongest racial effects in the RO study arm. We observed counterintuitive effects on medication adherence, with the smallest improvement observed at the site with the most intensive intervention. The interventions led to bigger drops in DBP and greater improvements in BP control, but had no effect on SBP, and only had racial effects on uncontrolled BP at the RO site compared to Control.

Unadjusted results indicated that BP improved at all sites, which may reflect the extension of secular trends in VA and elsewhere,[33] potentially facilitated by system-wide quality improvement efforts.[34] However, we observed higher baseline rates of uncontrolled BP (57.5%) than had others (54%),[35] possibly because we selected study sites serving large AA populations, which may not be representative of VA nationally. Since AAs with hypertension are younger on average, with higher rates of diastolic hypertension,[5] the effects of the intervention on diastolic BP may in part reflect the composition of our study participants (~75% AAs). On average, the AA participants were 2.5 years younger than the Whites in our study.

Our most intensive intervention led to a 1.73 mm Hg decline in DBP, and a greater decrease in uncontrolled BP. While small, a decrease of 2 mm Hg in DBP is associated with a clinically meaningful 6% reduction in coronary heart disease risk and a 13% reduction in stroke and transient ischemic attack risk,[35] suggesting a clinically significant payoff to a minimally resource-intensive intervention. There were no racial differences in the effects of the intervention on BP outcomes after adjustment for counseling and adherence, suggesting that racial disparities in BP clinical outcomes may be a function of these covariates, and echoing other findings from our group with another sample that suggested that racial disparities in BP dissipate once other associated factors are controlled.[12]

Among the full sample, White patients at RO experienced greater overall improvements in BP control, suggesting that the EMR reminder had differential effects by race. The counseling training may have attenuated this differential effect since the R+T site also experienced improved DBP without a concomitant increase in disparities. This suggests that EMR reminders alone are insufficient to improve care for minority patients and that culturally tailored interventions may be needed to achieve greater impact. Indeed, others found that disparities in diabetes outcomes were not related to quality of care provided by individual clinicians, suggesting that delivering the same care to all patients without tailor-

Table 4. Intervention effect and racial difference in intervention effects on BP

		Full sample using administrative data[a] (Neither PEI nor adherence data available), N=8,866			Subsample including PEI and adherence from survey data[a] Survey participants among the 8,866, (N=691)		
		SBP Estimate, (SE) P	DBP	Uncontrolled BP	SBP	DBP	Uncontrolled BP
Intervention effect (ref group = control site)	R+T	-.88 (.60) .14	-1.73 (.35) .00	-.14 (.07) .05	-4.90 (2.84) .08	-2.77 (1.69) .10	-1.13 (.35) .00
	RO	-.10 (.65) .88	-.70 (.37) .06	-.11 (.08) .15	-1.23 (2.52) .63	-.20 (1.50) .90	-.62 (.31) .05
Racial difference in intervention effect (ref group = racial difference at control site)	R+T	-.17 (1.55) .91	.66 (.89) .46	-.24 (.18) .19	7.02 (6.08) .25	2.69 (3.61) .46	.67 (.75) .38
	RO	-2.46 (1.61) .13	-.97 (.93) .30	-.51 (.19) .01	2.95 (5.47) .59	1.12 (3.24) .73	.37 (.68) .58

a. Variables included in the model are age, race, marital status, gender, BMI, comorbid conditions as in Table 1, tobacco use, time and site.

ing for individual needs may be insufficient for disparities reduction.[36]

We interpret our findings to mean that one size does not fit all for BP quality improvement or disparities reduction interventions. Prior VA research suggests that EMR reminders coupled with patient education achieved significant general gains in BP control.[20] Thus, the limited intensity of our one-time communication skills intervention may have been insufficient to produce the long term outcomes we sought to affect; while it may have increased the amount of information-giving and talking by providers, it may not have addressed the issues at the root of adherence problems or overall BP control. Thus, future adherence interventions may need to be more intensive and culturally tailored. Alternatively, our intervention might not have been targeted correctly; a focus on therapeutic intensification, for example, may have yielded greater improvements in BP.[37]

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Study Limitations

Our study was limited by the presence of several baseline differences between sites, the focus on mostly male veterans and the fact that since there were only three clinics randomized, the statistical power was limited, and this may account for the null findings. Also, the study was limited by the reliance on single rather than multiple BP measurements during each time period. However, our primary interest was in *changes* in BP resulting from our interventions, and analyses controlled for baseline differences, including differences among patients by site. We recognize that results from the VA setting may not be generalizable to women or other settings, yet as the largest health care system in the nation, with a focus on underserved patients, these results are relevant to a significant subset of the American population, though replication in other settings and samples would provide additional valuable information. Further, although we accounted for renal dysfunction in our analyses, AAs may have had more severe disease, making it harder to control BP. However, we did not have data on serum creatinine levels with which to assess this. Also, while the effects of our interventions were relatively small in magnitude, the interventions were low-cost, suggesting that even small scale efforts may have value. Finally, the absence of additional data on process (eg, number of visits, multiple BP measurements, therapeutic intensification) limited the full understanding of the findings.

Even with these limitations, our data have value in understanding how generic and multifaceted interventions may, or may not, affect BP outcomes. The fact that this focused and potentially scalable approach was associated with a small but clinically significant decrease in DBP suggests that some strokes may have been averted, with modest effort (though larger effects would have been desirable). Yet, the failure of the intervention to significantly affect racial disparities in BP outcomes suggests that generic interventions are not sufficient to address disparities and that tailored interventions are necessary.

Conclusion

The VA has made extensive efforts to improve the quality of chronic disease care; recent national rates of blood pressure control approximated 75% nationally. This increased attention to the quality of BP care resulted in increased facility-level focus on BP control rates (and rewards for better rates). Some facilities have implemented the hypertension reminder described here, along with a decision support system for hypertension care,[38] or the provision of nurse- or pharmacist-administered behavioral interventions,[39,40] evidencing the VA's commitment to improving BP outcomes. However, the approach used here, whereby clinicians' counseling skills are enhanced through training, has rarely been used to improve BP care in VA. Our results suggest that such an approach, combined with the EMR reminder, could lead to small clinical gains at a relatively small cost for the clinician time required for such training.

Our findings should also be evaluated in the context of results from other approaches to improving BP control. Most approaches, both in and outside the VA, have focused on improving health care quality in general, and thus have intervened at

the level of the health care provider, but fewer have been oriented toward the patient through the provider, in terms of changing medication adherence, or lifestyle, which can positively affect BP outcomes.[26] Evidence suggests that interventions aimed all or in part at patients can be highly successful in improving BP control.[20,41]

While quality improvement may lessen disparities in care,[42] our results suggest EMR reminders, a commonly employed quality improvement intervention, are unlikely to be sufficient to eliminate disparities in hypertension care and control. Thus, we conclude that a rising tide does not lift all boats equally, and that specifically targeted interventions must be used in future efforts to decrease disparities in the process and outcomes of hypertension care.

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Conflicts of Interest

The authors of this paper have no potential conflicts of interest to disclose.

Author Contributions

Research concept and design: Kressin. Acquisition of data: Kressin, Long, Orner, Clark, Rothendler, Berlowitz. Data analysis and interpretation: Kressin, Long, Glickman, Bokhour, Orner, Rothendler, Berlowitz. Manuscript draft: Kressin, Glickman, Bokhour, Clark. Statistical expertise: Glickman, Orner. Acquisition of funding: Kressin, Berlowitz. Administrative: Long. Supervision: Kressin, Long, Berlowitz.

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