

Treatment Decisions for Complex Patients: Differences Between Primary Care Physicians and Midlevel Providers

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Incorporating midlevel providers—nurse practitioners (NPs) or physician assistants (PAs)—into primary care practice is an effective way to boost revenue, improve patient access, and give physicians more time to see patients with complex conditions.¹⁻³ Since 1990, the number of PAs has grown from 24,000 to more than 64,000, while the number of NPs has more than quadrupled from 30,000 to more than 125,000.^{4,5} Today, 26 states allow NPs to practice independently without physician oversight.⁶ However, many leading organizations do not support NPs practicing independently until there is further evidence regarding patient outcomes.⁷⁻⁹

Previous studies have suggested that the quality of care delivered by midlevel providers is equal to that of physicians.¹⁰⁻¹⁴ Studies evaluating processes of care for diabetes care (eg, glycosylated hemoglobin [A1C], urine microalbumin, and low-density lipoprotein [LDL] test ordering; treating high lipid levels) also have shown similar results.^{15,16} However, the strongest body of evidence supporting lack of differences between physicians and midlevel providers is derived from studies assessing care for patients who are not clinically complex,¹⁷ provision of preventive care services,¹⁸ or delivery of care under the direct or delayed supervision of physicians.^{19,20}

The Veterans Health Administration (VHA), in response to ongoing pressure over the past decade to expand access to primary care,²¹ mandated a 200% increase in midlevel providers.^{22,23} According to most recent estimates, approximately 30% of VHA primary care providers (PCPs) are midlevel.²⁴⁻²⁷

VHA patients are complex, with poorer health status, more medical conditions requiring intensive management, and higher use of medical resources than the general US population.²⁸⁻³³ Most NPs and some PAs in the VHA system practice more or less independently, or under delayed physician supervision, and manage patients requiring high levels of decision-making complexity. Few studies have examined differences in practices among physicians and midlevel providers requiring decision making for complex patients with multiple chronic conditions.

The current study had 2 research objectives:

1. To examine whether the probability of treatment change for diabetic patients presenting with an elevated blood pressure (BP) measurement differed between physicians and midlevel providers.
2. To determine whether patient, provider, measurement, and/or organizational characteristics explained any of the observed differences.

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Objectives: To examine whether treatment change for diabetic patients presenting with elevated blood pressure (BP) differed between physicians and midlevel providers (nurse practitioners [NPs] and physician assistants [PAs]) and to determine reasons for any observed differences.

Methods: Analyses were part of a prospective cohort study of 1169 diabetic patients with scheduled visits to 92 primary care providers (PCPs) in 9 Midwest Veterans Health Administration facilities presenting with a triage BP of $\geq 140/90$ mm Hg. We analyzed predicted probabilities of treatment change by provider type.

Results: The PCPs included 64 physicians, 21 NPs, and 7 PAs. Patients treated by physicians and midlevel providers did not differ in their mean visit BP, number of chronic conditions, age, or number of BP medications. Controlling for current and past BP readings and patient characteristics, physicians were significantly more likely than midlevel providers to initiate a treatment change for elevated BP at a visit (53.8% vs 36.4%; $P = .001$). After controlling for additional visit-specific factors, practice style, measurement, and organizational factors, physicians were still more likely to initiate a treatment change (52.5% vs 37.5%; $P = .02$).

Conclusions: Midlevel providers were significantly less likely than physicians to change BP treatment for diabetic patients with multiple chronic conditions presenting with elevated BP at a single visit. We could not find good explanations for this difference. Given the expanding role of midlevel providers in delivering primary care to complex patients, we need to understand whether these treatment change differences lead to long-term differences in BP control.

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For author information and disclosures, see end of text.

Take-Away Points

Probability of treatment change by provider type was analyzed for diabetic patients with multiple chronic conditions who presented with elevated blood pressure (BP) at a single visit to a Veterans Health Administration physician or midlevel provider (nurse practitioner or physician assistant).

- Midlevel providers were significantly less likely than physicians to initiate a treatment change for elevated BP, although it was not clear why.
- Whether treatment change at a single visit could lead to long-term differences in BP control needs to be investigated.
- The reasons for this difference are unclear even though we examined a broad array of explanatory variables.

Data Sources

Data for our analyses came from 5 sources, including patient and provider surveys (see the [eAppendix](#) available at www.ajmc.com). Providers completed a baseline survey that assessed BP management practice style, general provider characteristics, and number of patients seen in clinic per half day. Providers also completed a brief visit survey after

METHODS

This analysis is part of a larger prospective cohort study (the ABATe [Addressing Barriers to Treatment for Hypertension] study) at 9 VHA facilities in 3 Midwestern states examining patient, clinician, and organizational factors that contribute to inadequate treatment of elevated BP among patients with diabetes with scheduled primary care visits.³⁴ The study protocol was approved by the institutional review boards of all participating facilities.

Study Setting and Design

Facilities. The 9 facilities varied in size and structure, with 3 large academic-affiliated medical centers, 1 large non-academic medical center, and 1 large and 4 small community-based outpatient clinics.

Primary Care Providers. We invited all nonresident PCPs with patient care responsibility at least 2 half days per week to participate in the study. Of the eligible 126 providers approached, 104 (71 physicians, 25 NPs, 8 PAs) consented to participate, for an overall recruitment rate of 83%. Once we excluded providers who had left their facilities by the time recruitment started, our final sample had 92 PCPs (64 physicians, 21 NPs, 7 PAs).

Patients. Research assistants approached 1556 patients who presented for a scheduled visit with a participating PCP and whose lowest triage BP was $\geq 140/90$ mm Hg. In addition to the triage BP level, patients had to meet the following inclusion criteria at screening: confirmed a diagnosis of diabetes, confirmed receiving diabetes care from the PCP, and identified the VHA facility as their main site of care. We excluded patients with impaired decision-making ability (eg, dementia, traumatic brain injury) or terminal disease and patients who resided in a nursing home or who did not speak English. Of the 1556 approached, 213 patients were found not to be eligible and 1169 provided written informed consent to participate in the study (87% of those approached and eligible; median facility-level recruitment rate, 89%). We enrolled a median of 14 patients per PCP (range 1-16).

each patient visit within the same clinic session that the provider saw the patient (99% completion rate). The visit survey asked whether medications were changed, reasons if no changes were made, and what patient issues were discussed during the visit. Patient characteristics were obtained from a baseline patient survey (91% completion rate). Review of electronic medical record–documented actions taken by the provider regarding BP management (including repeat BP measurement) at the enrollment visit. Finally, patient age and comorbidity (using *International Classification of Diseases, Ninth Revision* codes in the year prior to the enrollment visit), prescribed medications and their dosages, BP values, and patient medication adherence were obtained from VHA automated data sources.^{35,36}

Variables

Dependent Variable: Treatment Change in Response to Blood Pressure Elevation. Our main dependent variable was whether or not there was a treatment change by the provider in response to the elevated triage BP. We considered treatment change to have occurred if (1) the PCP indicated on the visit survey ($n = 1151$) or in the medical record ($n = 18$) if a visit survey was not completed that he or she added a medication or increased the dose of an existing medication; or (2) if the PCP documented in the medical record that he or she intended to bring the patient back for BP follow-up within 4 weeks.

Independent Variables and Covariates. The Hypertension Clinical Action Model describes successful clinical action in response to an elevated BP as being influenced by clinical uncertainty about the true BP values, competing demands, prioritization such as unrelated comorbidities, medication-related factors such as adherence, and organizational factors.³⁴ Using this model as our motivating framework, we examined specific patient, provider, visit, and organizational factors that we hypothesized could explain differences in BP treatment change between midlevel providers and physicians (**Figure**).

Baseline patient characteristics included both sociodemographic and clinical variables. We included the lowest systolic

blood pressure (SBP) and the lowest diastolic blood pressure (DBP) taken by the triage staff at the enrollment visit, and the patient's mean SBP in the year before the enrollment visit. The SBPs used to calculate mean SBP in the prior year included readings from the emergency department but not inpatient stays. We included all outpatient SBPs as they better reflect a patients' overall BP severity. We also included patient's age, race, sex, and number of chronic conditions using a VHA Health Economics Resource Center adaptation of

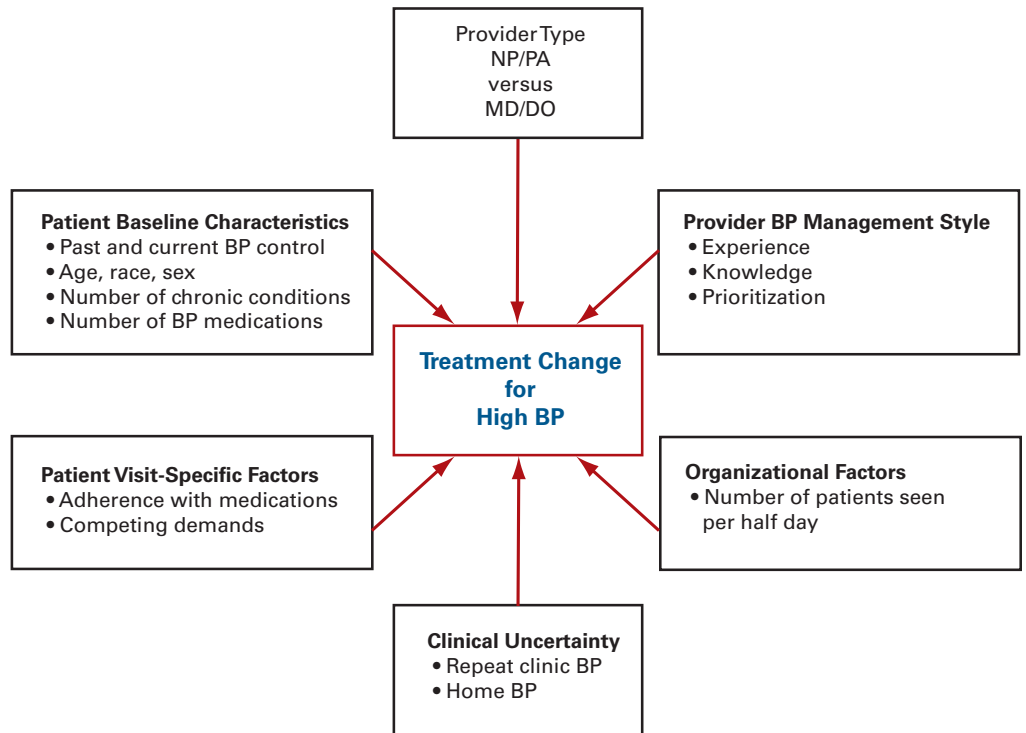
the Agency for Healthcare Research and Quality Clinical Classification Software,^{32,37,38} and the number of BP medication classes the patient was on before the enrollment visit.

Our patient-specific factors included 3 variables that could play a role in treatment change *at a visit*. Adherence to BP medications was assessed by using Steiner's refill gap measure calculated as a single measure for all BP medications prescribed.³⁹⁻⁴¹ We also included 2 competing demand factors: (1) whether the provider reported on the visit survey that he or she discussed 1 or more discordant conditions with the patient at the visit (eg, conditions pathophysiologically unrelated to hypertension and diabetes⁴²) and (2) whether the provider reported on the visit survey that he or she discussed medications or adherence issues with the patient during the visit.

Third, we included an organizational factor that might influence treatment change by provider type: the time available to see a patient (assessed by a question on the baseline provider survey, which asked for the average number of patients the provider saw in a half-day clinic).

We included several factors related to provider practice style: provider experience (defined as the number of years that the provider had been practicing), provider knowledge of SBP targets for patients with diabetes (based on reporting a target SBP of <130 mm Hg vs a higher target), and provider prioritization of BP (defined as a provider's willingness

■ **Figure.** Factors That May Explain Treatment Change by Provider Type



BP indicates blood pressure; DO, doctor of osteopathic medicine; NP, nurse practitioner; PA, physician assistant.

to wait longer than 4 weeks vs less than 4 weeks to follow up a BP level that was slightly above the provider's goal).

Finally, we included 2 variables related to clinical uncertainty regarding whether the enrollment visit triage BP reflected the patient's true BP value: (1) when the provider indicated in the medical record a repeat BP lower than 140/90 mm Hg or (2) when the provider recorded that the patient's home BP was adequate. We defined a priori the lowest triage BP done by a nurse with an electronic cuff as the unbiased measure of a patient's BP on the day of a visit. PCPs idiosyncratically chose to repeat a BP measurement, usually with a manual cuff, and not surprisingly were much less likely to intensify therapy when they documented that the BP was less than 140/90 mm Hg.³⁴ The literature suggests that these measurements are less accurate and less reliable than nursing BP measurements done with an electronic cuff.³⁴ Like reports of well-controlled home BP by patients, it is difficult to know how to interpret these alternative assessments of meeting BP targets, but it is important to control for the use of these alternative BP assessments in comparing intensification rates between provider types.

We conducted sensitivity analyses to further examine differences by provider type in treatment intensification in several ways. First, we incorporated patients' reports of a problem adding another medication to control their BP (from the baseline survey) to the full model. Second, we examined

differences by provider type regarding treatment change for elevated BP with only medication intensification (without inclusion of follow-up within 4 weeks) as the dependent variable. Third, we examined whether patients already being on high doses of BP medications contributed to lack of treatment change. Fourth, we evaluated differences in treatment change controlling for providers' propensity to intensify treatment. We also examined whether patients of midlevel providers and physicians differed in other patient characteristics that could possibly be related to differences in therapy intensification. We also compared reasons midlevel providers and physicians provided from among choices presented on the visit survey for not intensifying medications among the 635 patients whose therapy was not intensified at the visit.

Statistical Analyses

We constructed a 3-level multivariate model (with patients clustered within provider clustered within site).⁴³ Using logistic regression models, we first examined the association of provider type (physician vs midlevel) with treatment change (BP medication intensification at the visit or planned prompt follow-up within 4 weeks to reassess BP). We controlled for baseline patient sociodemographic and clinical characteristics only (enrollment visit BP and mean SBP in the prior year, age, race, sex, number of chronic conditions, number of BP medication classes). In a second model, we additionally controlled for provider factors (years in practice, provider prioritization of BP, goals for BP), visit factors (discussion of medication adherence or discordant health condition at visit, patient medication adherence gaps), organizational factors (number of patients seen per half day), and BP measurement factors (home BP and repeat visit BP) that could further explain differences by provider type. For clarity of presentation, we calculated a probability of treatment change by provider type for a typical patient (white, male, and age 56-75 years, with all other variables held at their mean). The provider and site random effects were set to zero, which means that the predicted probability is for that of a median provider at the median site seeing a white, male, 56- to 75-year-old patient, with all other characteristics set to their mean population values apart from the provider type (physician vs midlevel). All analyses were conducted using Stata software, version 10.0 (StataCorp, College Station, TX).

RESULTS

Baseline Characteristics

Patient Characteristics. Baseline patient demographic and clinical characteristics by provider type are presented in **Table 1**. There were no differences between patients seen by midlevel providers and physicians with respect to mean SBP

at the enrollment visit (about 154 mm Hg) and prior year SBP (about 145 mm Hg). There also were no differences in patients' age, race, sex, or number of comorbid conditions. Patients seen by midlevel providers had a higher mean DBP (79.4 vs 77.4 mm Hg; $P = .01$) and had been prescribed, on average, 2.0 BP medications compared with 2.2 BP medications for patients seen by physicians.

In terms of *visit-specific factors*, there were no differences in patient medication adherence gaps or discussion of discordant conditions at the visit. However, midlevel providers were more likely to report discussing medications and/or compliance at the visit (14% vs 9%; $P = .01$).

Provider Characteristics. There were no differences between midlevel providers and physicians in years of practice, knowledge of BP management in diabetes, or prioritization of BP control for diabetes patients.

Organizational and Measurement Factors. Physicians were more likely to report seeing 6 or more patients per half-day clinic than midlevel providers (84% vs 61%; $P = .01$). There were no differences by provider type in recording that the patients' home BP was adequate or that a repeat BP was less than 140/90 mm Hg.

Treatment Change

Overall, 573 of 1169 (49%) patients had a treatment change for elevated BP at the visit. Most of those patients had a medication started and/or dose increased (511/573), and the remaining 62 had a documented plan to follow up BP within 4 weeks. The likelihood of treatment change increased with higher levels of triage SBP and DBP and higher levels of mean prior year SBP. Age, race, and sex were not associated with the likelihood of treatment change.

Predicted probabilities for treatment change by provider type are presented in **Table 2**. In model 1, after controlling for current/past BPs and patient sociodemographic and clinical characteristics, physicians were significantly more likely to initiate a treatment change at the visit for an elevated BP (53.8% vs 36.4%; $P = .001$). In model 2, after controlling for patient sociodemographic and clinical characteristics, visit-specific factors, provider practice style, measurement, and organizational factors, physicians were still significantly more likely to initiate a treatment change at the visit (52.5% vs 37.5%; $P = .02$).

Sensitivity Analyses

After adjusting for patients' reports of a problem adding another medication to control their BP in the full model, physicians were still more likely than midlevel providers to initiate treatment change for elevated BP (53.8% vs 36.9%; $P = .01$). Similarly, physicians were more likely than midlevel

■ **Table 1.** Baseline Patient, Provider, and Organizational Characteristics

Baseline Characteristics	Midlevel Providers (n = 353)	Physicians (n = 816)	P
Patient sociodemographic and clinical characteristics			
SBP, mean (SD), mm Hg	153.8 (13.8)	153.7 (13.5)	.89
DBP, mean (SD), mm Hg	79.4 (12.0)	77.4 (12.0)	.01
Prior year SBP, mean (SD), mm Hg	144.5 (15.4)	145.0 (15.0)	.67
Age, mean (SD), y	65.8 (11.0)	65.9 (10.6)	.87
White, no. (%)	242 (72)	615 (77)	.12
Male, no. (%)	344 (97)	787 (96)	.37
No. of chronic conditions excluding diabetes and hypertension, mean (SD)	3.8 (2.2)	4.0 (2.3)	.39
No. of BP medications, mean (SD)	2.0 (1.2)	2.2 (1.3)	.02
Adherence gaps $\geq 20\%$, no. (%)	91 (26)	177 (22)	.13
Discussed 1 or more discordant conditions at the visit, no. (%)	203 (58)	434 (55)	.38
Discussed medications and/or compliance at the visit, no. (%)	48 (14)	68 (9)	.01
Repeat BP <140/90 mm Hg, no. (%)	84 (24)	162 (20)	.13
Home BP recorded as adequate, no. (%)	32 (9)	63 (8)	.44
Provider BP management style, patient clinic-specific factors, organizational characteristics, and clinical uncertainty			
Years in practice, mean (SD)	12.3 (9.5)	11.0 (7.9)	.51
SBP target, mean (SD), mm Hg	131.0 (5.9)	129.5 (4.5)	.20
Willing to wait >4 weeks to follow up an elevated BP, no. (%)	10 (36)	24 (38)	.83
Average of patients in a half-day clinic more than 6, no. (%)	17 (61)	54 (84)	.01
BP indicates blood pressure; DBP, diastolic blood pressure; SBP, systolic blood pressure.			

providers to intensify treatment for elevated BP even after adjustment for patients already being on high doses of BP medications and providers' propensity to intensify treatment change (52.5% vs 37.6%; $P = .02$; and 52.6% vs 37.3%; $P = .02$, respectively).

To assess whether the definition of treatment change in our model altered our findings, we repeated our analyses with only medication intensification (without inclusion of follow-up within 4 weeks) in the dependent variable. The differences between physicians and midlevel providers with respect to initiation of treatment change remained large and significant (45.6% vs 26.5%; $P < .001$).

When we examined other patient characteristics that could possibly be related to differences in therapy intensification, we found no differences by provider type in rates of patient home BP monitoring (62% vs 57%; $P = .118$), nor of patient report of side effects related to BP medications ($P = .22$).

Reasons for Lack of Treatment Change

To further elucidate potential reasons for the observed differences in intensification rates, we examined the reasons

PCPs provided for not intensifying treatment that we collected immediately after each visit (Table 3). The mean number of responses regarding not intensifying therapy for elevated BP did not differ between physicians and midlevel providers (physicians 1.50 ± 0.80 ; PAs/NPs 1.51 ± 0.81). Physicians were more likely than midlevel providers to indicate as a reason for not intensifying therapy that their patients were unwilling to change or add medication (8% vs 3%; $P = .03$). Midlevel providers listed "other reasons" for not intensifying therapy more often than physicians (19% vs 14%; $P = .05$). The category "other reasons" included prescribing diet and exercise, providing home BP monitors, referring patient to a BP clinic, or deferring to a PCP outside the VHA system.

DISCUSSION

Midlevel providers were significantly less likely to change BP treatment for diabetic patients with multiple chronic conditions even after controlling for a number of patient, provider, and organizational characteristics. Specifically, differences persisted even after we controlled for clinical uncertainty

■ **Table 2.** Predicted Probability of Treatment Intensification

Model	No. of Patients	Predicted Probability (95% CI)		P
		Midlevel Providers	Physicians	
1 ^a	1113	36.4% (26.8, 47.1)	53.8% (45.1, 62.2)	.001
2 ^b	1061	37.5% (26.2, 50.5)	52.5% (42.4, 62.4)	.02

BP indicates blood pressure; CI, confidence interval.

^aFor model 1, predicted probabilities were calculated for a typical patient (white, male, age 56-75 years; other variables were held at their mean). Covariates included patient BP at baseline; patient age, race, and sex; number of chronic conditions; and number of BP medications.

^bFor model 2, predicted probabilities were calculated for a typical patient (white, male, age 56-75 years; all others were variables held at their mean) being seen by a typical physician or nonphysician provider at a typical site (meaning a random effect level set to zero for both provider and site). Covariates included patient BP at baseline; patient age, race, and sex; number of chronic conditions; number of BP medications; patient medication adherence; competing demands at visit; number of patients seen in a half day; good home BP and low repeat BP at visit; and provider experience, knowledge, and prioritization.

about the true BP value and for several visit, patient, provider, and organizational factors. Results did not change significantly when we examined differences by provider type in medication intensification, rather than in medication intensification and follow-up combined. Indeed, the fairly comprehensive set of potential explanatory variables that we assessed did not seem to account for any of the difference in intensification rates between physician and midlevel providers.

Outcomes for patients cared for by NPs have been found to be comparable to those for patients cared for by physicians.^{18-22,44,45} Hopkins and colleagues¹⁸ conducted a well-designed controlled trial randomly assigning 1300 (214

of providers—only 7 NPs and 17 physicians. The more recent study by Ohman-Strickland and colleagues¹⁵ on diabetes care quality found that several processes of care for diabetes such as checking glycemic and lipid levels were more frequent in family practices that employed NPs than in all physician practices. However, their analyses were conducted at the practice level (with confounding organizational characteristics), did not assess differences at the provider level, and did not adjust for important patient sociodemographics. Additionally, details on the role of midlevel providers within the practice and whether midlevel providers functioned independently or had a specific role within the practice were not provided.

■ **Table 3.** Provider Reasons for Not Intensifying Medication Therapy^a

Provider-Reported Reason	No. (%)		P
	Midlevel Provider (n = 237)	Physicians (n = 398)	
Repeat BP adequate	28 (12)	47 (12)	.18
BP in good control today	62 (26)	81 (20)	.09
BP is close enough to goal	22 (9)	55 (14)	.09
BP usually good even though high today	47 (20)	68 (17)	.39
Patient reports lower BP at home	39 (16)	74 (19)	.50
Patient didn't take medications before visit	47 (20)	86 (22)	.60
Patient not willing to change or add medication	8 (3)	31 (8)	.03
Patient compliance can be improved	32 (14)	70 (18)	.18
Intensification would create side effects	7 (3)	16 (4)	.49
Intensification would make regimen too complex	1 (0.4)	5 (1.3)	.29
Intensification unlikely to lower BP	2 (0.8)	2 (0.5)	.60
Other more pressing issues today	23 (10)	43 (11)	.66
Other reasons ^b	46 (19)	54 (14)	.05

BP indicates blood pressure.

^aReported by providers in the brief visit survey. Providers were able to choose more than 1 response as a reason for not intensifying medication therapy.

^bOther reasons included patient referred to BP class or offered BP monitor, consult entered for hypertension clinic, reinforced diet and exercise, outside provider titrating medications, need more information on patient, and recent medication change made.

diabetic) patients presenting to the emergency department to midlevel providers or physicians; they measured outcomes of patient satisfaction, health status, and utilization and found no differences by provider type in patients' A1C level or BP at 6-month follow-up. However, this study was conducted in a single city, included an exclusively Hispanic (>90%) population, and had a small sample

Although much of the attention in comparative studies has focused on patient outcomes, there is a growing body of evidence that NPs and physicians also differ in the preventive and treatment strategies they use during patient encounters. Analyses of the National Ambulatory Medical Care Survey found that midlevel providers had more visits for “nonillness” care and more emphasis on therapeutic/preventive care.^{46,47} Using medical record reviews of patient encounters, other investigators have found that physicians focused care delivery on secondary prevention, while midlevel providers tended to provide more education and counseling.²³ Because control of BP among diabetes patients falls into the category of secondary prevention, this difference in focus is one possible explanation of the difference in treatment change rates that we observed.

Guidelines for comparative studies call for a randomized controlled trial or studies that use several sources of data conducted at multiple sites. To our knowledge, ours is the largest multisite study with the most clinically detailed data sources to examine treatment intensification by provider type for medically complex patients. There are, however, some limitations to our study. Although there is a national consensus that BP in high-risk patients (eg, patients with diabetes) is undertreated, it is impossible to know what the right level of treatment change is for these complex patients. While we found that midlevel providers changed treatment less often than physicians at a single visit, it is possible that physicians in this study were overtreating these patients. However, we did choose a higher cut point for elevated BP (140/90 mm Hg) compared with that recommended by the American Diabetes Association⁴⁸ (SBP \leq 130 mm Hg), which more than 80% of providers surveyed thought should be the systolic target for patients with diabetes. So there is little question that the presenting BP needed attention. Second, it could be that midlevel providers were more appropriately taking into account medication side effects and contraindications that were not fully measured in our study. However, we assessed patient reported concern for medication side effects overall and for BP medications in particular using items adapted from the Horne scale⁴⁹ and found no significant differences in patient-reported medication side effects by provider type. Third, this study was designed to look at treatment change at one visit. A different picture may emerge when we examine treatment change over time. It is possible that midlevel providers intensify less frequently but as effectively in the long run or that they more effectively address adherence issues. Finally, our study was conducted in the VHA and hence may not be generalizable to other healthcare settings.

We found that midlevel providers were significantly less likely to change BP treatment for diabetic patients with multi-

ple chronic conditions presenting with elevated BP at a single visit. However, we lack a potential explanation for these differences, despite examining a broad array of possible explanatory variables based on a comprehensive conceptual model. Thus, it is difficult to consider any specific policy changes based on this finding. We can say that given the expanding role of midlevel providers in delivering primary care to complex patients, we need to better understand whether differences in BP treatment change by provider type at a single visit lead to long-term differences in BP management and control.

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