

Clinician Awareness of Adherence to Hypertension Guidelines

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PURPOSE: Little is known about how well clinicians are aware of their own adherence to clinical guidelines, an important indicator of quality. We compared clinicians' beliefs about their adherence to hypertension guidelines with data on their actual performance.

METHODS: We surveyed 139 primary care clinicians at three Veterans Affairs medical centers, asking them to assess their own adherence to hypertension guidelines. We then extracted data from the centers' clinical databases on guideline-concordant medication use and blood pressure control for patients cared for by these providers during a 6-month period. Data were collected for patients with hypertension and diabetes, hypertension and coronary disease, or hypertension with neither of these comorbid conditions.

RESULTS: Eighty-six clinicians (62%) completed the survey. Each clinician saw a median of 94 patients with hypertension (mean age, 65 years). Patients were treated with an average of 1.6 antihypertensive medications. Overall, clinicians overestimated the proportion of their patients who

were prescribed guideline-concordant medications (75% perceived vs. 67% actual, $P < 0.001$) and who had blood pressure levels $< 140/90$ mm Hg on their last visit (68% perceived vs. 43% actual, $P < 0.001$). Among individual clinicians, there were no significant correlations between perceived and actual guideline adherence ($r = 0.18$ for medications, $r = 0.14$ for blood pressure control; $P \geq 0.10$ for both). Clinicians with relatively low actual guideline performance were most likely to overestimate their adherence to medication recommendations and blood pressure targets.

CONCLUSION: Clinicians appear to overestimate their adherence to hypertension guidelines, particularly with regards to the proportion of their patients with controlled blood pressure. This limited awareness may represent a barrier to successful implementation of guidelines, and could be addressed through the use of provider profiles and point-of-service feedback to clinicians. *Am J Med.* 2004;117:747-754. ©2004 by Elsevier Inc.

Clinical practice guidelines for the management of hypertension have been developed and actively promoted for decades, yet only one third of patients with hypertension have their blood pressure adequately controlled (1,2). There are several explanations as to why guidelines often fail to improve quality of care (3), one of which may be a perception among individual clinicians that they are already practicing high-quality medicine, which reduces the motivation to actively change practice behaviors (4). Without data to describe individual patterns of performance, clinicians may overestimate their adherence to guidelines and not fully recognize opportunities for improvement (5,6). We therefore surveyed clinicians about their perceived adherence to clinical practice guidelines for the treatment of patients with

hypertension, comparing their self-assessments with their actual adherence to guideline recommendations for medication regimens and blood pressure control.

METHODS

This study was a pre-intervention component of the Assessment and Treatment of Hypertension: Evidence-based Automation (ATHENA) project, a study of a guideline implementation system to improve the management of hypertension in primary care clinics (7-9).

Participants

Clinicians were selected from primary care general medicine, geriatric, and women's health clinics of the Veter-

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ans Affairs (VA) Palo Alto Health Care System (including both teaching and nonteaching clinics in seven area communities), the San Francisco VA Medical Center, and the Durham VA Medical Center. Eligible providers included all clinicians with prescribing privileges and their own panel of patients, including staff physicians, medical residents and fellows, and nurse practitioners and physician assistants (who can prescribe antihypertensive medications without consulting a physician). Clinicians who were involved in developing the ATHENA trial, and those who were not expected to remain in primary care for the anticipated duration of the trial (e.g., interns in 1-year positions, graduating third-year residents, and staff members who anticipated leaving the primary care clinics), were excluded.

Survey

The survey of clinicians at the three study sites was conducted in July and August of 2001. Of 152 eligible providers, surveys were sent to 139; the remaining providers were not sent surveys because of incomplete clinic rosters. In the survey, we used five-item scales (from “strongly disagree” to “strongly agree”) to assess self-reported familiarity with and attitudes toward guidelines for the management of hypertension established by the Sixth Report of the Joint National Commission (JNC-VI), the version in use at that time (1). In dichotomizing responses, we considered a response of “agree” or “strongly agree” to represent familiarity with or a positive attitude toward practice guidelines. We next asked clinicians to estimate “what percentage of your patients with a diagnosis of hypertension are on a medication regimen recommended by JNC-VI guidelines?” and “what percentage of your patients with a diagnosis of hypertension currently (at their last visit) have systolic blood pressure <140 mm Hg and diastolic blood pressure <90 mm Hg?” To simplify the survey, we did not ask clinicians to assess (nor did we analyze) adherence to the lower blood pressure goals (<130/85 mm Hg) recommended by the JNC-VI for patients with diabetes. Finally, we asked clinicians to estimate the use of specific medications in their patients with “uncomplicated” hypertension, which we defined as hypertension without coronary artery disease, diabetes mellitus, chronic heart failure, or renal insufficiency or failure.

Patient Data

To assess actual guideline adherence, we employed clinician profiling software developed for data extracted from the VA's VISTA electronic medical record system. We identified all patients with a diagnosis of hypertension on the computerized problem list who were scheduled for at least one visit to a primary care clinic during the 6-month study period. If a patient made more than one visit, we sampled only the last visit. Using the *International Classification of Disease, Ninth Revision* diagnoses from out-

patient encounter forms, inpatient discharge diagnoses, and the computerized problem list, we then evaluated these patients for the presence or absence of comorbid conditions that defined exclusion criteria and clinical subgroups for our study (described below). These data sources have high positive and negative predictive values for the presence of common chronic illnesses relevant to drug choices for hypertension (10).

We excluded patients with chronic heart failure because the available data did not allow us to distinguish between systolic and diastolic heart failure and thereby identify patients with preserved ejection fraction for whom the guidelines may have been less applicable. We also excluded patients with acute or chronic renal insufficiency.

The remaining patients were sorted into clinical subgroups of hypertension with diabetes, hypertension with coronary artery disease, or “uncomplicated” hypertension. Patients with both diabetes and coronary artery disease were assigned to the diabetes group. We further divided patients with diabetes into those with and without proteinuria, based on the presence of a qualitative urinalysis of $\geq 1+$ (30 mg/dL) or a corresponding quantitative analysis. In addition, patients with coronary artery disease who had a possible contraindication to beta-blockers (asthma, chronic obstructive pulmonary disease, peripheral vascular disease, or depression) were evaluated with the “uncomplicated” hypertension group because they were not considered to have a compelling indication for beta-blockers.

For each patient, we assessed blood pressure control using intake vital signs from the last primary care clinic visit during the 6-month period of data collection. Medication use was assessed by the presence of active prescriptions in the VA outpatient pharmacy at the end of the 6-month period.

Adherence to recommendations for medication use was assessed using expanded guidelines developed for the ATHENA project. These expanded guidelines were very similar to JNC-VI guidelines, except that angiotensin-converting enzyme (ACE) inhibitors were considered an appropriate first-line therapy for uncomplicated hypertension, based on clinical trial results released after the publication of the JNC-VI guidelines (11,12). Consequently, patients with uncomplicated hypertension were considered guideline concordant if they were prescribed a beta-blocker, thiazide diuretic, or ACE inhibitor. Patients with hypertension and coronary artery disease were considered concordant if they were prescribed a beta-blocker. Patients with hypertension and diabetes with proteinuria were considered guideline concordant if they were prescribed an ACE inhibitor or angiotensin-receptor blocker. Diabetic patients without documented proteinuria were considered guideline concordant if they were prescribed an ACE inhibitor, angiotensin-receptor

blocker, or thiazide diuretic. Because the survey asked clinicians specifically about adherence to JNC-VI guidelines, secondary analyses were conducted that corresponded more strictly to the JNC recommendations (i.e., not considering ACE inhibitor therapy as guideline adherent for patients with uncomplicated hypertension).

Hypertension was considered controlled if blood pressure was <140/90 mm Hg at the most recent patient visit. For simplicity and consistency with the clinician survey, we used the same blood pressure cutoff for all patients, including those with diabetes. For the analyses, each patient was assigned to the clinician whom he or she had seen at the most recent clinic visit. Each of the 86 clinicians in the analytic cohort met prespecified criteria of having had scheduled visits for 10 or more patients with hypertension during the 6-month study period. Two clinicians had fewer than 10 patients with uncomplicated hypertension in their panels and thus were excluded from analyses that focused specifically on this clinical subgroup.

The study was approved by the institutional review boards of Stanford University; the University of California, San Francisco; the San Francisco VA Medical Center; and the Durham VA Medical Center.

Statistical Analysis

Perceived and actual guideline adherence by clinicians are presented as means. Actual guideline adherence represents the percentage of patients within a clinician's panel who met the criteria for adherence to medication guidelines and blood pressure targets. For each analysis of actual guideline adherence, patient-specific data were aggregated at the level of the clinician before being combined with data from other physicians to form a sample mean. The unweighted average of clinician-specific percentages was considered the sample mean.

Comparisons of perceived versus actual guideline adherence within individual clinicians were done using paired *t* tests and linear correlation with calculation of Pearson correlation coefficients and associated *P* values. Additional comparisons of adherence using quartiles of performance were conducted with unpaired two-sample *t* tests. We evaluated several potential predictors for clinicians misestimating their own performance, classifying clinicians as "high overestimators" if they overestimated their own guideline adherence by more than the median degree of overestimation for medication guidelines (10%) and blood pressure control (25%). Predictors of overestimating guideline performance were assessed using the chi-squared test. Variables with *P* values <0.20 in bivariate analyses were entered into a logistic regression model in backward stepwise fashion. All analyses were conducted with Intercooled Stata, version 6.0 (Stata Corp, College Station, Texas). Significance was set at *P* <0.05.

RESULTS

Surveys were completed by 86 (62%) of the 139 clinicians, with similar response rates across each of the three geographic areas (range, 59% to 67%, *P* = 0.72). Panel characteristics and rates of guideline adherence were similar among clinicians who responded to the survey compared with those who did not. Providers saw between 16 and 512 unique patients with hypertension (median, 94 patients) during the study period (Table 1). The mean (\pm SD) patient age was 65 ± 5 years, and women comprised 5% of patients. Patients were prescribed an average of 1.6 antihypertensive medications.

Table 1. Clinician and Patient Characteristics

Characteristic	Number (%), Mean \pm SD, or Percentage
Clinicians (n = 86)	
Practice site	
Site 1	34 (40)
Site 2	28 (33)
Site 3	24 (28)
Profession	
Physician	72 (84)
Resident	14 (16)
Staff or fellow	58 (67)
Registered nurse practitioner or physician assistant	14 (16)
Male sex	42 (49)
Time since graduation from professional school	
<3 years	16 (19)
3–10 years	28 (33)
>10 years	31 (36)
Missing	11 (13)
Number of hypertensive patients in panel	
<50	28 (33)
50–149	33 (38)
≥ 150	25 (29)
Patients*	
Age (years)	65 ± 5
Female sex	5%
Blood pressure (mm Hg)	$141 \pm 4/78 \pm 4$
Clinical subgroups	
Uncomplicated hypertension	60%
Hypertension with coronary artery disease	11%
Hypertension with diabetes with proteinuria	9%
Hypertension with diabetes without proteinuria	20%

* Calculated using aggregate values from each clinician's panel. Each of the 86 study clinicians who contributed data had between 16 and 512 patients with hypertension.

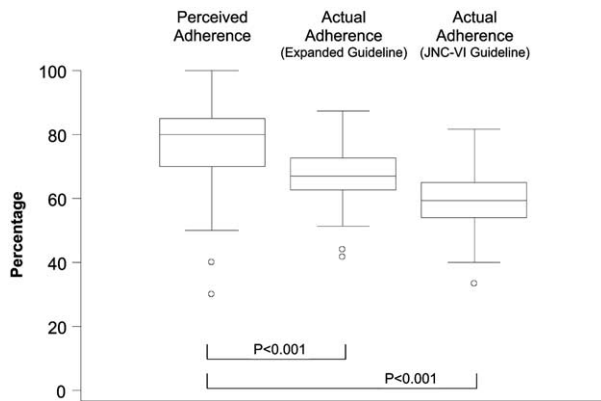


Figure 1. Percentage of patients prescribed guideline-recommended medications, according to physician perceptions and actual prescriptions. Boxes represent the 25th and 75th percentiles; bars in the middle of the boxes represent medians; error bars represent 95% confidence intervals; and circles represent outlying observations. JNC-IV = Sixth Report of the Joint National Commission.

Adherence with Medication Guidelines

Overall, clinicians estimated that 75% of their patients (median, 80%) were prescribed medications concordant with guidelines (Figure 1). Actual adherence was lower, with an average of 67% of patients prescribed guideline-concordant medications (median, 67%; $P < 0.001$ for difference between perceived and actual adherence). When a stricter interpretation of the JNC-VI guidelines (in which only thiazides and beta-blockers were considered first-line therapy for uncomplicated hypertension) was used, 60% of patients were prescribed guideline-concordant medications (median, 59%; $P < 0.001$ for difference).

Adherence with Blood Pressure Goals

Clinicians significantly overestimated their success in meeting blood pressure targets (Figure 2). On average, clinicians estimated that 68% of their patients (median, 70%) had blood pressure levels $< 140/90$ mm Hg on their last visit. These targets were actually met by 43% of patients (median, 43%; $P < 0.001$ for difference). The best-performing clinician had 68% of patients at or below target blood pressure.

Individual Predictive Ability

Among individual clinicians, there was no significant correlation between rates of perceived and actual adherence to medication guidelines ($r = 0.18$, $P = 0.12$; Figure 3A), as well as between rates of perceived and actual blood pressure control ($r = 0.14$, $P = 0.21$; Figure 3B). For example, clinicians with the lowest ($< 37\%$) and highest ($> 50\%$) quartiles of actual blood pressure control had similar rates of perceived blood pressure control (67% vs. 69%, $P = 0.65$).

Clinicians were more prone to overestimating than underestimating their adherence to guidelines. Nine percent of clinicians underestimated the percentage of their patients with guideline-recommended medications by more than 15%, whereas 38% of clinicians overestimated their patients' adherence to medication guidelines by more than 15%. Forty-three percent of clinicians overestimated adherence to blood pressure targets by more than 30%.

Clinicians were not accurate in estimating the proportion of their patients who were prescribed specific medications (Table 2). They estimated that 4% of patients with uncomplicated hypertension were not prescribed any antihypertensive medications when the actual number was 23% ($P < 0.001$). Clinicians also overestimated by 14% to 20% the proportion of patients with uncomplicated hypertension who were prescribed a beta-blocker or thiazide diuretic. However, they were somewhat more accurate in their estimates of patients prescribed other antihypertensive medications.

Determinants of Accurate Estimation of Guideline Adherence

We next conducted bivariate analyses to assess the association between several variables and being a high overestimator of guideline adherence. For both endpoints (being a high overestimator of adherence to medication and blood pressure guidelines), clinicians with lower rates of actual guideline adherence were significantly more likely to overestimate their guideline adherence for both medication guidelines (25 high overestimators among 40 clinicians with below-median actual adherence vs. 15 high overestimators among 40 clinicians with

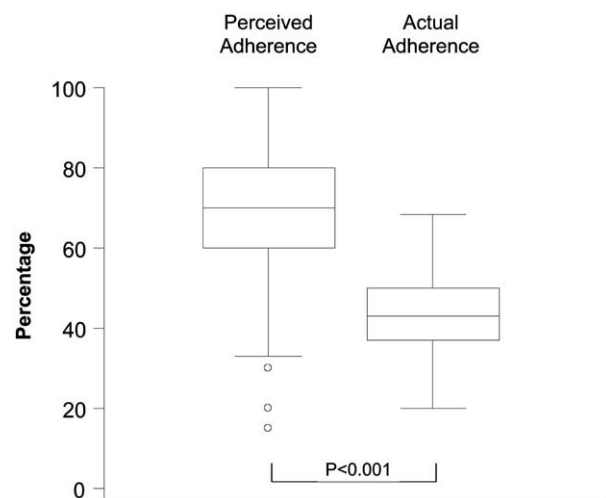


Figure 2. Percentage of patients who achieved blood pressure $< 140/90$ mm Hg, according to physician perceptions and actual achievement of these goals. Boxes represent the 25th and 75th percentiles; bars in the middle of the boxes represent medians; error bars represent 95% confidence intervals; and circles represent outlying observations.

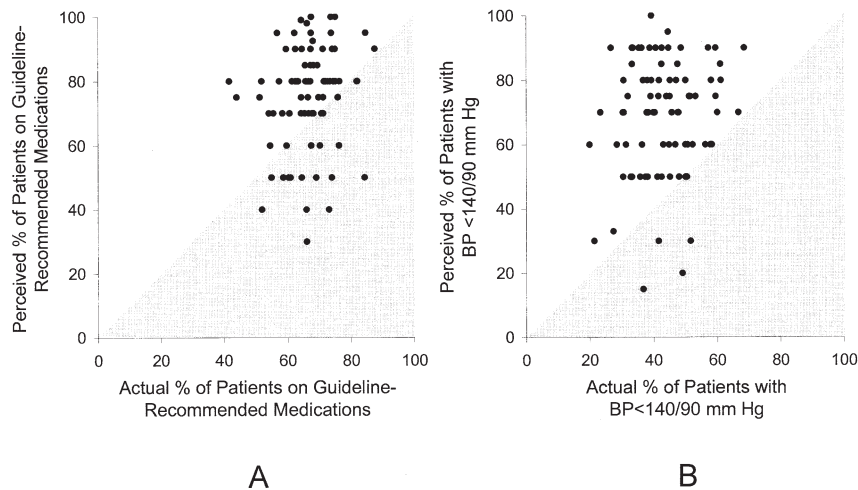


Figure 3. Clinicians' perceived and actual adherence to medication guidelines (A) and blood pressure targets (B). The shaded areas contain clinicians who underestimated the percentage of their patients who were guideline adherent; the light areas contain clinicians who overestimated their adherence. BP = blood pressure.

above-median adherence, $P = 0.03$) and blood pressure guidelines (30 high overestimators among 43 clinicians with below-median adherence vs. 11 high overestimators among 41 clinicians with above-median adherence, $P < 0.001$). For example, the average rate of perceived guideline adherence was roughly similar for clinicians with relatively low or high rates of actual guideline adherence (Figure 3). As a result, clinicians with relatively low rates of actual adherence were more likely to fall short of their self-perceptions.

In analysis of other variables, high overestimation of guideline adherence was not associated significantly with clinician profession ($P = 1.00$ for medication guidelines, $P = 0.20$ for blood pressure guidelines), clinician sex ($P = 0.82$ for medication, $P = 0.19$ for blood pressure), panel size ($P = 0.97$ for medication, $P = 0.79$ for blood pressure), familiarity with JNC-VI guidelines ($P = 0.46$ for

medication, $P = 0.93$ for blood pressure), attitude toward JNC-VI guidelines ($P = 0.75$ for medication, $P = 0.26$ for blood pressure), or frequency of switching patients with controlled blood pressure to guideline-recommended medications ($P = 0.59$ for medication, $P = 0.90$ for blood pressure). For two variables there was a nonsignificant trend towards an association with high overestimation of adherence to medication guidelines. For practice site there were 18 high overestimators/34 clinicians at Site 1 versus 15/23 at Site 2 and 7/23 at Site 3 ($P = 0.06$), and for years since graduation from professional school there were 9 high overestimators/14 clinicians for < 3 years versus 15/27 for 3 to 10 years and 9/28 for > 10 years ($P = 0.09$). For both of these variables there was no association with being a high overestimator of adherence to blood pressure guidelines ($P = 0.82$ for practice site, $P = 0.66$ for years since graduation).

Table 2. Perceived versus Actual Medication Prescribing For Patients with Uncomplicated Hypertension within the Panels of 84 Clinicians*

Treatment	Patients on Medications [†]			
	As Perceived by Clinicians	Actual [‡]	Difference	P Value
No antihypertensive drugs	4%	23%	-19%	<0.001
ACE inhibitors	32%	28%	4%	0.09
Beta-blockers	46%	31%	14%	<0.001
Calcium channel blockers	19%	22%	-4%	0.10
Thiazide diuretics	52%	32%	20%	<0.001
Other antihypertensive drugs	13%	20%	-6%	0.003

* Two clinicians were excluded from the analysis because they had fewer than 10 patients with uncomplicated hypertension in their patient panel.

[†] Columns add to more than 100% because many patients were taking more than one antihypertensive drug.

[‡] Calculated using aggregate values from each clinician's panel.

ACE = angiotensin-converting enzyme.

In multivariable analyses, being a high overestimator of medication guideline adherence was associated significantly with only one variable: actual adherence to medication guidelines (odds ratio for below-median actual adherence [OR] = 3.5; 95% confidence interval [CI]: 1.2 to 10.8). For blood pressure control, being a high overestimator of guideline adherence was associated independently with both actual guideline adherence (OR for below-median actual adherence = 8.4; 95% CI: 2.9 to 24.2) and clinician sex (OR for female sex = 3.0; 95% CI: 1.1 to 8.7). There was a modest but significant correlation between clinicians' misestimates of adherence to medication guidelines and their misestimates of adherence to blood pressure targets ($r = 0.25$, $P = 0.02$).

DISCUSSION

In this study, clinicians had difficulty assessing their own adherence to guidelines for the management of patients with hypertension. In aggregate, clinicians slightly overestimated their adherence to medication guidelines and substantially overestimated their adherence to blood pressure targets. However, among individual clinicians there was little correlation between their perceived and actual guideline adherence for both of these quality measures. Indeed, individuals with the lowest level of guideline adherence had self-assessments that were similar to those of clinicians with the best guideline adherence. These inaccurate self-assessments were not limited to one type of provider, being evenly distributed across clinicians of different professions and practice volume.

The clinical importance of hypertension has long been recognized. Yet despite more than 30 years of large-scale efforts to implement hypertension practice guidelines, the quality of care remains far short of desired goals. Recent reports suggest that only half of patients with hypertension are receiving any treatment, and that only one third have their blood pressure under control (2,13,14). Our findings identify a potential cause of this suboptimal care and suggest opportunities for improvement.

We evaluated one factor that may explain guideline underperformance: the potential for overoptimistic assessment of one's current practice and the resultant failure to recognize the need for improvement (3,15). Clinicians may conflate their intentions with actual behavior, resulting in high levels of perceived adherence and obscuring the potentially wide gap between intentions and practice. This inaccurate self-assessment may reduce a clinician's impetus to change and severely limit the utility of self-assessed metrics by which to measure that change.

Experiments in a variety of nonmedical settings have developed the theoretical groundwork for this problem. Studies have suggested that the theories that people develop about themselves can bias their recall of past events

(16). Similarly, it has been found that self-assessments of performance for a given task are largely driven by general views of one's ability rather than a focused analysis of the task itself (5,17). Since most people believe that their abilities are better than average, the result is overoptimistic self-assessment (5,6). Subjects in these studies who had the worst performance were most likely to lack the skills that would allow them to recognize their errors, and as a result tended to have the most inflated self-assessments, a finding that may help explain our results (4,5).

Studies of self-assessment among medical professionals have also demonstrated substantial gaps between perceptions and behavior. Early studies of obstetric guidelines found little change in increasing rates of Caesarian section despite physician belief that rates were falling in accordance with updated guidelines (18). Subsequent studies have documented wide variations in the accuracy of aggregate estimates of performance in the provision of preventative services, cancer screening, and management of common outpatient diseases, with physicians overestimating their performance in most cases (15,19–21). This phenomenon begins early in training. Self-assessed performance of health professional trainees has low-to-moderate validity, with little improvement (and in some cases, worsening) over time (17).

The limited accuracy of self-assessment suggests that clinician feedback may be a useful mechanism by which to orient physicians to the reality of their behavior. Individual profiles may be particularly important. Unlike group- or facility-level profiles, individual feedback has greater relevance to the individual clinician (22). Perhaps more importantly, because most clinicians believe they are "above average," they may be less likely to interpret substandard group performance as pertaining to them (5,15,23).

Unfortunately, past experiences with clinician profiling have not been universally successful. Data on the effect of feedback on changing clinician behavior are conflicting and of limited quality (22,24). Successful experiences with feedback have tended to occur when it was directed and immediate, and when conducted as part of a multidimensional intervention (22,24,25). Feedback may be particularly useful as a "priming" strategy, alerting physicians that they are not achieving guideline targets and thereby increasing their receptivity to subsequent interventions, including real-time patient-specific decision support (e.g., the ATHENA Decision Support System, a software system being studied at the VA) (8,9). Such interventions may help overcome a variety of knowledge, attitude, and behavioral barriers that impede the quality of care for patients with hypertension (3,14,19,26–30).

Several limitations to our study merit mention. Some patients may not have been a member of the treating clinician's primary care panel, and some patients from that panel may

not have been seen during the study period. Our computer algorithm also had limited ability to capture the subtleties of individual patients and may have missed comorbid conditions that might have influenced appropriate patient care. Blood pressure data were based on the clinic intake blood pressure and did not capture further readings that may have been obtained by the clinician during the office visit. Finally, we were unable to assess medication use delivered through non-VA pharmacies. However, because the VA's pharmacy benefit provides patients with a strong financial incentive to fill their medications within the VA system, we are unlikely to have missed substantial quantities of non-VA prescriptions. It is also important to note that a revised version of the JNC guidelines has recently been published. However, our data were collected before this update, at a time when the JNC-VI guidelines were widely considered to be a standard of care. Moreover, the expanded guidelines used in our primary analysis incorporated research published since the release of the JNC-VI guidelines, thereby anticipating some of the important guideline changes that were announced with the most recent version (2). The updated guidelines reinforce many of the recommendations made in JNC-VI, such as the use of thiazides for uncomplicated hypertension, giving continued salience to our findings.

In summary, we found that clinicians had difficulty assessing their own compliance with hypertension guidelines and that clinicians with the lowest levels of adherence were the most likely to gauge their performance with a high degree of inaccuracy. Providing feedback to clinicians, particularly at the point of service, may be an important means by which to align perceptions with reality, thus providing clinicians with an impetus to improve, while simultaneously giving them an objective metric by which to measure progress.

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