Action or Inaction? Decision Making in Patients With Diabetes and Elevated Blood Pressure in Primary Care

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OBJECTIVE — Hypertension increases micro- and macrovascular complications of diabetes. The goal for blood pressure is <130/80 mmHg. In primary care, however, blood pressure in many patients exceeds this goal. In this study, we evaluated the clinical decision-making process when a patient with diabetes presents with elevated blood pressure.

RESEARCH DESIGN AND METHODS — Twenty-six primary care practices in two practice-based research networks in Colorado participated. Questionnaires were completed after each encounter with an adult with type 2 diabetes. Data obtained from the survey included *1)* demographic information, *2)* blood pressure results, *3)* action taken, *4)* type of action if action was taken, and *5)* reasons for inaction if action was not taken. Bivariate and multivariate analyses were performed to identify predictors of action.

RESULTS — Completed surveys totaled 778. Blood pressure was 130/74 ± 18.8/12.0 mmHg (mean ± SD). Sixty-two percent of patients exceeded goals. Action was taken to lower blood pressure in 34.9% of those. Predictors of action were *1)* blood pressure level, *2)* total number of medicines the patient was taking, and *3)* patient already taking medicines for blood pressure. As blood pressure rose, providers attributed inaction more often to "competing demands" and reasons other than "blood pressure being at or near goal."

CONCLUSIONS — No evidence was found for patterns of poor care among primary care physicians. Providers balance the clinical circumstances, including how elevated the blood pressure is, and issues of polypharmacy, medication side effects, and costs when determining the best course of action. Knowledge deficit is not a common cause of inaction.

Diabetes Care 29:2580–2585, 2006

There is extensive clinical evidence linking hypertension with micro- and macrovascular complications of diabetes, including randomized controlled trials and a meta-analysis (1–6). Until 2000, the target blood pressure for individuals with diabetes was the same as that for individuals without diabetes (<140/90 mmHg). However, because of the demonstrated clinical benefit of lower blood pressure specifically for diabetes, national guidelines, established by the American Diabetes Association and the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7), call for more intensive management, with a target of <130/80 mmHg (7,8).

Of the care provided to patients with type 2 diabetes, ~90% takes place in primary care practices (9). Unfortunately, blood pressure control in these settings is frequently suboptimal (10–12) and may be even worse in those with diabetes and hypertension compared with those with hypertension alone (13).

An essential component of lowering blood pressures to goal is the clinical decision made by the primary care provider at the visit in which blood pressure is elevated. Multiple factors may influence this decision. For example, it has been found that optimal blood pressure control often requires three or more medications (8), leading to increased costs and rates of adverse drug reactions. Other described barriers are patient compliance (14), the complexity of diabetes care (15), or simply providers' oversight (16).

Decision making may best be studied by investigating the decisions made during actual clinical encounters. Oliveria et al. (17) examined decision making for visits with elevated blood pressures, although not limited to patients with diabetes. They found that in only 38% of patients with elevated blood pressures was there intensification of therapy. Recently, Cotton et al. (18) published a study evaluating treatment decisions for patients with hypertension and diabetes. In their cohort, therapy was intensified in only 26% of patients. Reasons given by providers for no action were similar in the two studies and included "need to continue monitoring," "competing demands," and "blood pressure acceptable." One limitation in these studies was their retrospective design, which meant that providers were asked to identify reasons up to 2–4 weeks after the visit, thus potentially introducing a recall bias.

Despite their importance in diabetes outcomes, we are aware of no published studies on clinical decisions and the decision-making process at the point of care for elevated blood pressure in patients with diabetes. The purpose of this study was to investigate the decisions made in primary care when a patient with type 2 diabetes presents with an elevated blood pressure as part of a clinical encounter.

RESEARCH DESIGN AND METHODS

Practices from two Colorado practice-based research networks participated. The Colorado Research Network comprises 32 mostly urban and underserved practices. The High Plains Research Network is a network of 27 rural

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Received for publication 1 June 2006 and accepted in revised form 27 August 2006.
A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.
DOI: 10.2337/dc06-1124

and frontier primary care practices throughout northeastern Colorado. For each participating site, instructions were given as to how and on whom the study was to be performed. Materials included an explanation on the purpose of the project: to study decision making among primary care medical providers when confronted with a patient with diabetes and a given blood pressure. It was made clear that the purpose was not to study adherence with national guidelines.

At each participating practice, a brief questionnaire was completed by the provider after each encounter with a nonpregnant adult (≥18 years) with a diagnosis of type 2 diabetes. Surveys were completed over a 2- to 4-week period between June 2003 and May 2004. Data obtained from the survey included *1*) demographic and other information on the provider and patient, including whether there was a communication problem (e.g., language barrier), *2*) the blood pressure reading at the visit, *3*) action taken on the blood pressure, *4*) type of action if action was taken (medications and/or lifestyle changes), and 5) reasons given by the provider for inaction if no action was taken. If more than one blood pressure reading was taken or used in the decision-making process, the provider was asked to circle the blood pressure result that led to the decision. For analysis, all surveys were deidentified to minimize the Hawthorne effect, i.e., the risk of changing clinical behaviors because the clinician felt the survey could be traced back to him or her.

Analyses were performed using patient demographic characteristics and socioeconomic status. Insurance status was used as a surrogate for income, combining Medicaid and Discounted ("low income") versus all other payer sources ("all other income"). Discounted refers to a State of Colorado program for individuals with income <200% of the federal poverty level. To investigate whether medication costs contributed to the clinical decisions, we compared Medicare only (which lacked medication coverage at the time of the study) with all other types of insurance combined (including patients with both Medicare and additional insurance that covered medications). Lastly, to assess burden of disease in the cohort, we stratified by total number of prescription medications (dichotomized at ≤6 and >6 based on an approximately equal distribution) and by number of hypertensive medications specifically.

Patients were initially categorized into two blood pressure groups. The elevated blood pressure group consisted of patients whose systolic blood pressure was at least 130 mmHg and/or diastolic blood pressure was at least 80 mmHg. The normal blood pressure group consisted of all other patients. Blood pressure was also stratified separately for systolic and diastolic levels, as well as a combined variable. In the combined categories, blood pressure was classified as "at goal" (systolic <130 mmHg and diastolic <80 mmHg), "above previous goal" (systolic ≥140 mmHg or diastolic ≥90 mmHg, the goal before 2000), or "near goal" (not "at goal" but systolic <140 mmHg and diastolic <90 mmHg).

Bivariate analysis

Bivariate analyses were performed to identify significant associations between patient characteristics and blood pressure (elevated versus normal). Those with elevated blood pressure were further stratified into whether or not action was taken on the blood pressure and by degree of elevation and associations between type of action or reason for inaction and degree of elevation examined.

For all categorical patient and action characteristics, the χ^2 test was performed to determine associations, whereas for continuous patient characteristics, the two-sample *t* test was used. For categorical patient characteristics when the χ^2 test was violated (expected frequencies <5 in at most 20% of the categories), Fisher's exact test was used. Results regarding these variables should be considered preliminary. Percentages, totals, and *P* values are reported.

Multivariate analysis

Using the patients with elevated blood pressure, multivariate logistic regression analyses were performed to examine associations between whether action was taken during the visit and degree of elevation or number of medications, adjusting for sociodemographic and clinical covariates. Initially multivariate models that accounted for clustering of patients within practices were explored. However, because the variance component for practice was nonsignificant (intraclass correlation coefficient = 0.03; $P = 0.2015$), classic multivariate logistic regression analyses were performed. Multivariate analyses were used to calculate the adjusted odds ratio and 95% CI for the following variables: systolic blood pressure, diastolic blood pressure, combined blood pressure, number of prescription medications, and number of hypertensive medications. Because the systolic and diastolic variables are highly correlated, five separate models were performed that controlled for a base set of demographic variables (age, sex, Hispanic ethnicity, provider type, communication problems, and income level) and the inclusion of each blood pressure variable separately. Base model covariates were selected to adjust for general demographics (age, sex, Hispanic ethnicity, and provider type) and covariates that were significant from the bivariate analysis at the α level of 0.20 (communication problems and income level).

For the models that examined the association between blood pressure elevation (systolic, diastolic, and combined) and action, the number of prescription medications was selected to control for medications, because the bivariate association was more significant than that considering the number of hypertension medications. For the models that examined the association between number of medications (number of prescription medications and number of hypertensive medications) and action taken, blood pressure elevation was controlled by using combined systolic and diastolic blood pressure. Unadjusted logistic analyses were also performed for each of the hypertension variables.

For the bivariate analyses, *P* values are displayed, and for the logistic regression analyses odds ratios and 95% CI are reported. This study received approval from the Colorado Multiple Institutional Review Board and other ethics committees overseeing participating sites.

RESULTS — Twenty-six practices participated, consisting of 22 family medicine practices (5 residency sites) and 4 general internal medicine practices (1 residency); 14 sites were rural/frontier (43.5% of the visits). Among the clinicians, 66% were in family medicine, 14% were residents in training, 12% were nurse practitioners or physician assistants, and the majority had been in practice 10 years or less. Participants in this study were deidentified, making analysis using specific provider information impossible.

Surveys were completed for 778 encounters. Most patients were female, nearly half were Hispanic, mean age was 58.1 years, and almost half were of lower socioeconomic status (Table 1). Blood

Table 1—*Patient characteristics among all patients and among those with elevated blood pressure (≥130 mmHg systolic and/or ≥80 mmHg diastolic)*

	All patients	Elevated BP	Normal BP	*P* value
n	778	479	299	
Race/ethnicity				0.717
White, non-Hispanic	331 (42.5)	200 (41.8)	131 (43.8)	
Hispanic	373 (47.9)	229 (47.8)	144 (48.2)	
African American, non-Hispanic	31 (4.0)	22 (4.6)	9 (3.0)	
Other/do not know	40 (5.1)	25 (5.2)	15 (5.0)	
Missing	3 (0.4)	3 (0.6)	0 (0.0)	
Sex				0.310
Male	287 (36.9)	170 (35.5)	117 (39.1)	
Female	488 (62.7)	307 (64.1)	181 (60.5)	
Missing	3 (0.4)	2 (0.4)	1 (0.3)	
Insurance (patients may have more than one)				
Medicare	299 (38.4)	185 (38.6)	114 (38.1)	0.890
Medicaid	136 (17.5)	85 (17.7)	51 (17.1)	0.806
Private insurance	129 (16.6)	71 (14.8)	58 (19.4)	0.095
Discounted	220 (28.3)	142 (29.6)	78 (26.1)	0.284
Unknown	11 (1.4)	8 (1.7)	3 (1.0)	0.545*
Other	59 (7.6)	36 (7.5)	23 (7.7)	0.928
Medication coverage				0.989
Yes (any insurance except Medicare only)	554 (71.2)	341 (71.2)	213 (71.2)	
No (Medicare only)	224 (28.8)	138 (28.8)	86 (28.8)	
Age	58.1 ± 13.7	58.7 ± 13.3	57.2 ± 14.3	0.158
Income surrogate				0.212
Low	355 (45.6)	227 (47.4)	128 (42.8)	
All other income	423 (54.4)	252 (52.6)	171 (57.2)	
No. of prescription medications				0.356
≤6	445 (57.2)	268 (55.9)	177 (59.2)	
>6	326 (41.9)	207 (43.2)	119 (38.8)	
Missing	7 (0.9)	4 (0.8)	3 (1.0)	
No. of BP medications				<0.001
0	178 (22.9)	84 (17.5)	94 (31.4)	
1	227 (29.2)	154 (32.2)	73 (24.4)	
≥2	355 (45.6)	235 (49.1)	120 (40.1)	
Missing	18 (2.3)	6 (1.3)	12 (4.0)	

Data are *n* (%) or means ± SD. *At least 20% of the cells have expected values <5; Fisher's exact test was used. Results should be considered preliminary. BP, blood pressure.

pressure was 130/74 ± 18.8/12.0 mmHg (mean ± SD). Goals were met for systolic blood pressure (<130 mmHg) in 48% (n = 372) of patients and for diastolic blood pressure (<80 mmHg) in 60% (n = 468) of patients, but only 38% (n = 298) of patients met the goals for both. However, an additional 26% (n = 203) were near goal. Not surprisingly, patients with elevated blood pressure were more likely to be taking one or more hypertensive medications ($P < 0.001$).

Among those with elevated blood pressure and complete blood pressure data (n = 478; for 1 patient only a systolic reading was listed), action was taken in 34.9%. Notably, among those with blood pressure "near goal," the action rate was only 13.3%, but the rate quadrupled when the blood pressure was "above previous goal" (Table 2). When action was taken, pharmacologic interventions became more likely at higher blood pressure levels, whereas lifestyle changes decreased in frequency as the blood pressure rose (not statistically significant). If no action was taken, the reasons for inaction were more likely to be "competing demands," "new or transient increase," or "unfamiliar with patient" when the blood pressure was higher. "Blood pressure at or near goal" was listed as a reason for inaction three times more often when the blood pressure was "near goal," compared with when the blood pressure was "above previous goal." In the multivariate analysis, action was more likely with higher blood pressure readings. Action was also more likely for those taking six or less total prescription medications or if the patient was already taking a single blood pressure medication (Table 3).

CONCLUSIONS— To our knowledge, provider decision making at the point of care for elevated blood pressure in patients with diabetes is a previously unexplored phenomenon. In this study, 62% of patients had blood pressures above the target, which is comparable to a recent report in which 65% of patients with diabetes in the primary care setting had elevated blood pressures (19). Oliveria et al. (17), in a retrospective analysis of patients with hypertension (not limited to those with diabetes), found action to occur in 39% of patients when blood

Table 2—*For patients with elevated blood pressure, action taken, type of action, or reasons for inaction*

	All patients with elevated BP	Elevated BP, "near goal"	Elevated BP, "above previous goal"	*P* value
n	478	203	275	
Action taken	167 (34.9)	27 (13.3)	140 (50.9)	<0.001
Type of action*				
Increasing dose of medication or adding medication	138 (82.6)	18 (66.7)	120 (85.7)	0.017
Dietary/lifestyle intervention	41 (24.6)	8 (29.6)	33 (23.6)	0.503
Missing	2 (1.2)	1 (3.7)	1 (0.70)	NA
Action not taken	311 (65.1)	176 (86.7)	135 (49.1)	<0.001
Reasons for inaction*				
BP at or near goal	167 (53.7)	132 (75.0)	35 (25.9)	<0.001
Competing demands	53 (17.0)	19 (10.8)	34 (25.2)	0.001
BP improving	17 (5.5)	7 (4.0)	10 (7.4)	0.187
Orthostatic risk	7 (2.3)	4 (2.3)	3 (2.2)	NA
New or transient increase	54 (17.4)	13 (7.4)	41 (30.4)	<0.001
Unfamiliar with patient	29 (9.3)	11 (6.3)	18 (13.3)	0.033
All other reasons combined	70 (22.5)	22 (12.5)	48 (35.6)	<0.001

Data are *n* (%). Note that the *P* value is based on a χ^2 test between blood pressure elevation and action (yes or no), i.e., the last two columns. *More than one type of action or reason for inaction could be listed. BP, blood pressure.

pressure was elevated. In this study, the overall action rate was similar (35%). Cotton et al. (18) found identical rates of uncontrolled blood pressure among patients with diabetes (62%) but lower rates of action (26%). Of note, in the study of Oliviera et al., the mean blood pressure was higher (153/84 mmHg), and blood pressure in 93% of patients exceeded the target of 140/90 mmHg. In our study, 26% of patients are "near goal," and action in this group is infrequent. This phenomenon has been referred to as "clinical inertia" (20).

There were three predictors for action in patients with blood pressures above goals: *1*) blood pressure level, *2*) total number of medicines a patient was already taking at the time of the visit, and *3*) patient already taking medicines for blood pressure. Although clinicians clearly based their decisions on both systolic and diastolic blood pressure levels, there was a more robust response to elevated systolic blood pressure. Considering medications, for patients already taking seven or more medicines, providers were less likely to intensify therapy, suggesting sensitivity to issues of polypharmacy, cost, and the difficulties with complicated medication regimens. Interestingly, providers were less likely to act if the patient was not taking a medicine for blood pressure. This suggests a higher threshold before committing patients to long-term therapy if they were not already taking prescribed hypertension medications.

The specific therapy used when providers acted on elevated blood pressure varied according to how high the blood pressure was above goal and was consistent with rational clinical decision making. There was a greater likelihood of medication adjustments with higher blood pressures, probably because of the need for greater and/or quicker blood pressure reductions. The reasons given by providers for no action may reflect an individualized approach to patient care, rather than an unquestioned adherence to guidelines. For example, blood pressure at or near goal was listed as a reason much less frequently as blood pressures rose, whereas competing demands were more common at higher blood pressure. Overall, the clinician believed the blood pressure was in the appropriate range in only about one of eight patients in whom the blood pressure was elevated. Although this might indicate an ongoing need for provider education, it appears that balancing clinical decisions accounts for most instances of inaction not knowledge deficits.

This investigation of decision making at the point of care has many potential strengths, such as eliminating recall bias to more accurately determine the provider's intent and thought processes, but it also has significant limitations. A potentially very significant limitation is the Hawthorne effect, which may introduce bias because providers may be more likely to take action due to the survey. To attenuate that risk, providers were specifically instructed that this survey was not a measure of adherence to guidelines, and they were aware that the surveys were anonymous and could not be linked back to them. Further, providers in these two practice-based research networks participate in surveys similar to this twice yearly on average and thus may be somewhat "immune" to the Hawthorne effect. Also, considering the survey study design, in a study that examined glycemic control decisions, the rate of action increased modestly from 55% before a survey to 64% during the survey, suggesting only a modest Hawthorne effect (21). Lastly, previously reported action rates for elevated blood pressures were similar in studies with different designs (17,18), suggesting that point-of-care evaluation does not change behavior significantly. A second potential limitation is that testing at one point in time may not be representative of usual practice patterns. The large sample size and multiple practice sites involved may decrease this risk. Third, it may be argued that an isolated blood pressure reading taken in the clinic may not represent the patient's true blood pressure. In this study, however, we were aiming to evaluate decision making during the usual course of care rather than determining the most accurate blood pressure; thus, it is consistent with current clinical practice and has good validity for the question considered. Lastly, because of the large Hispanic population in this study (reflecting Colorado demographics), this study may be less generalizable

Table 3—*Multivariate results: provider action on patients with elevated blood pressure (n = 478) by BP level and clinical characteristics*

		Logistic regression results				
			Adjusted			
	Patients with elevated BP	Unadjusted	Model 1 with systolic BP	Model 2 with diastolic BP	Model 3 with combined BP and no. of Rx medications	Model 4 with combined BP and no. of BP medications
Age (years)	58.7 (13.3)	1.002 (0.988–1.016)	1 (0.982–1.018)	1.023 (1.005–1.041)	1.006 (0.989–1.024)	1.003 (0.986–1.021)
Sex						
Male	170 (35.6)	Ref.	Ref.	Ref.	Ref.	Ref.
Female	306 (64)	0.735 (0.498–1.086)	0.709 (0.454–1.108)	0.82 (0.531–1.267)	0.739 (0.473–1.153)	0.645 (0.412–1.01)
Missing*	2 (0.4)					
Hispanic ethnicity						
Yes	228 (47.7)	Ref.	Ref.	Ref.	Ref.	Ref.
No	231 (48.3)	0.943 (0.643–1.383)	1.083 (0.668–1.757)	0.982 (0.616–1.564)	1.02 (0.629–1.652)	0.978 (0.608–1.574)
Do not know	9 (1.9)	1.424 (0.372–5.452)	1.589 (0.361–6.991)	1.138 (0.259–4.994)	1.604 (0.362–7.098)	1.611 (0.35–7.412)
Missing*						
Provider						
Resident	76 (15.9)	1.262 (0.762–2.088)	1.134 (0.635–2.025)	1.452 (0.83–2.54)	1.214 (0.677–2.175)	1.313 (0.734–2.35)
Nonresident	402 (84.1)	Ref.	Ref.	Ref.	Ref.	Ref.
Communication						
Yes	44 (9.2)	1.627 (0.87–3.042)	1.315 (0.638–2.711)	1.235 (0.616–2.474)	1.411 (0.681–2.924)	1.367 (0.641–2.917)
No	434 (90.8)	Ref.	Ref.	Ref.	Ref.	Ref.
Income						
Low	226 (47.3)	1.396 (0.958–2.036)	1.409 (0.872–2.279)	1.358 (0.853–2.163)	1.358 (0.842–2.19)	1.374 (0.851–2.219)
All other income	252 (52.7)	Ref.	Ref.	Ref.	Ref.	Ref.
Systolic BP†						
<130 mmHg	73 (15.3)	Ref.	Ref.	Ref.	Ref.	Ref.
130–139 mmHg	152 (31.8)	1.8 (0.8–4.1)	1.843 (0.771–4.401)			
140–159 mmHg	189 (39.5)	8 (3.7–17.7)	9.069 (3.969–20.725)			
≥160 mmHg	64 (13.4)	11.9 (4.9–28.9)	12.219 (4.846–30.808)			
Diastolic BP†						
<80 mmHg	170 (35.6)	Ref.	Ref.	Ref.	Ref.	Ref.
80–89 mmHg	208 (43.5)	1.1 (0.7–1.7)		1.005 (0.614–1.644)		
≥90 mmHg	100 (20.9)	4.7 (2.8–8)		4.82 (2.651–8.761)		
Combined BP†						
"Near goal"	203 (42.5)	Ref.	Ref.	Ref.	Ref.	Ref.
"Above previous goal"	275 (57.5)	6.8 (4.2–10.8)			7.223 (4.41–11.84)	6.841 (4.17–11.22)
No. of Rx medications†						
≤6	268 (56.1)	Ref.	Ref.	Ref.	Ref.	Ref.
>6	206 (43.1)	0.5 (0.4–0.8)	0.476 (0.302–0.75)	0.52 (0.334–0.809)	0.461 (0.29–0.73)	
Missing*	4 (0.8)					
No. of BP medications†						
0	84 (17.6)	Ref.	Ref.	Ref.	Ref.	Ref.
1	153 (32)	2.7 (1.5–4.8)				2.406 (1.22–4.75)
≥2	235 (49.2)	1.7 (1–3)				1.247 (0.64–2.44)
Missing*	6 (1.3)					

Data are means ± SD, *n* (%), or OR (95% CI). *Unadjusted and adjusted logistic regression analyses did not include missing data. †Logistic results significant at $P < 0.01$. Ref., reference; Rx, prescription. BP, blood pressure.

to other areas of the U.S. However, we found no significant differences when we compared ethnicities. Furthermore, this limitation may also be considered a strength by adding to the developing body of literature that includes groups traditionally less represented in research.

From this study, it is clear that whereas blood pressures above national goals are common, the majority of patients are at or close to target. This finding suggests that primary care clinicians are actively and aggressively trying to control a major cardiovascular risk factor in their patients with diabetes. We did not find evidence for a pattern of a poor quality of care. On the contrary, providers seemed willing to consider the needs of their patients and the specific clinical circumstances, including how elevated the blood pressure is, and issues such as polypharmacy, medication side effects, and costs when determining the best course of action.

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