Physician and Patient Characteristics Associated With Clinical Inertia in Blood Pressure Control

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Clinical inertia, the failure to adjust antihypertensive medications during patient visits with uncontrolled hypertension, is thought to be a common problem. This retrospective study used 5 years of electronic medical records from a multispecialty group practice to examine the association between physician and patient characteristics and clinical inertia. Hierarchical linear models (HLMs) were used to examine (1) differences in physician and patient characteristics among patients with and without clinical inertia, and (2) the association between clinical inertia and future uncontrolled hypertension. Overall, 66% of patients experienced clinical inertia. Clinical inertia was associated with one physician characteristic, patient volume (odds ratio [OR] =0.998). However, clinical inertia was associated with multiple patient characteristics, including patient age (OR=1.021), commercial insurance (OR=0.804), and obesity (OR=1.805). Finally, patients with clinical inertia had 2.9 times the odds of uncontrolled hypertension at their final visit in the study period. These findings may aid the design of interventions to reduce clinical inertia. *J Clin Hypertens (Greenwich).* 2013;15:820–824.

While virtually all physicians are aware of the importance of blood pressure (BP) control in their patients and that numerous effective antihypertensive medications exist, there continues to be many patients who do not meet therapeutic goals (BP <140/90 mm Hg or <130/80 mm Hg for people with diabetes or chronic kidney disease).[1] Similarly, although management of hypertension has improved over time, half of hypertensive patients still have uncontrolled BP.[1–3] A common explanation for these high rates is that medications need to be adjusted over time or augmented with a second antihypertensive medication to maintain therapeutic goals, but physicians often fail to increase therapy when goals are not met.[4,5]

Clinical inertia, the failure to adjust medication regimens when a patient has uncontrolled hypertension, is a persistent problem with inadequate solutions. Clinical inertia has been shown to occur in 51% to 93% of visits by patients with uncontrolled hypertension.[6–9] Moreover, higher rates of clinical inertia have been found among patients with comorbid conditions, including diabetes and chronic kidney disease.[5–7,10] Clinical inertia has also been directly linked to BP control over time, with one study finding that clinical inertia accounted for 19% of the variance in BP control.[5] Clinical inertia has been attributed to both patient and physician characteristics, with studies linking clinical inertia to medication nonadherence,[8] provider judgment,[9,11,12] number of chronic conditions,[13] and severity of hypertension.[10] However, few studies have examined both physician and patient characteristics to determine their relative contributions to clinical inertia. In order for interventions designed to reduce clinical inertia to be properly targeted, it is important to assess the role of patient factors in conjunction with physician factors on the probability of a patient experiencing clinical inertia.

This study combines electronic medical record (EMR) data with data on physician characteristics from a large multispecialty group practice to assess the role of physician and patient characteristics on the incidence of clinical inertia for hypertension. The study also determines the proportion of variability in experiencing clinical inertia that can be attributed to the physician vs the patient. Additionally, this study examines the impact of experiencing clinical inertia on the probability of having uncontrolled hypertension at the last visit observed for each patient during the study period.

METHODS

Data

The study used EMR-extracted data from a multispecialty medical group practice in central Florida for patient visits between January 2005 and February 2010. The practice offers primary and specialty care services for patients of all ages, including laboratory and radiology services. Patients were insured by multiple commercial payers as well as Medicare and Medicaid. At the time of the study, the practice had 125 physicians, representing 27 different medical specialties at 13 practice sites. Physicians treated patients across multiple practice sites. Furthermore, the individual practice sites ranged from single-specialty offices with one or two physicians to a large location with more than

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Manuscript received: April 25, 2013; **revised:** June 24, 2013; **accepted:** July 7, 2013
DOI: 10.1111/jch.12179

80 physicians in over 20 specialties. Data were extracted for all patients with newly diagnosed hypertension, defined has having an *International Classification of Diseases, Ninth Revision* (*ICD-9*) code indicating a hypertension diagnosis (401.xx–404.xx), a BP reading ≥140/90 mm Hg (or ≥130/80 mm Hg with diagnosed diabetes), and no hypertensive therapy for the 6 months preceding an initial observed prescription order for antihypertensive medication. Because of limitations of the data provided, we were unable to apply the 130/80 mm Hg threshold to patients with chronic kidney disease.[1] The date of the first observed antihypertensive prescription is considered the index date. To be included in the study, the patient had to be at least 18 years of age, have EMR data available for at least 6 months prior to the index date and 6 months after the index date, and have at least two documented BP readings, including the reading from the index date and another reading (not necessarily exceeding the therapeutic goal) within 30 to 365 days after the index date. Patients who were pregnant, had stage IV or V chronic kidney disease, had secondary hypertension (*ICD-9* code of 405.xx), had active drug or alcohol abuse, or had a known malignancy were excluded. A total of 3125 patients were identified as meeting the inclusion and exclusion criteria and were included in the study cohort.

Measures

Clinical inertia is generally defined as documented hypertension with no associated modification of therapy within 30 days of a hypertensive BP measure. As described above, only patients with newly diagnosed hypertension indicated by a BP measure and an *ICD-9* diagnosis code were included. Next, clinical inertia was identified by a combination of ≥2 consecutive hypertensive BP measures and no change in medication within 30 days of the first of those measures. The only exception to this identification is if the patient had no follow-up visit within 30 days after a hypertensive BP measure but therapy was modified during the next visit. This circumstance was not identified as clinical inertia, as the physician may have decided to watch and wait until the next visit, which is often considered clinically appropriate if only a single instance of hypertension is recorded. For statistical analysis, which was conducted with patients as the unit of observation, patients were categorized into two groups based on whether they experienced clinical inertia ≥1 times during the study period.

Physician and patient characteristics are included in the analysis as independent variables. Physician factors include age, sex, physician type (internal medicine, family medicine, or others), average patient volume per month, and years in practice. Patient factors included age, sex, Hispanic/Latino ethnicity, and smoking status. Patients' body mass index (BMI) was categorized into 5 groups based on the 4 World Health Organization[14] groups and an "unknown" category. Because 15% of patients in the study had an unknown BMI, we chose to include this category rather than exclude a larger number of observations. Patients' index date BP, insurance status, the presence of ≥1 comorbidities, and whether the patient saw a specialist (other than the primary care physician) during the study period were also included as control variables. Additionally, the number of physician visits and the number of hospitalizations within the study period are included as independent variables.

Statistical Analysis

Multivariate analyses with a cross-sectional approach were conducted using SAS 9.2 (SAS Institute, Cary, NC). Because physicians treat multiple patients across practice sites, observations from individual patients are likely to be correlated by physician. Therefore, two-level hierarchical linear models (HLMs) were estimated to account for the clustering of patients within physicians. The first regression model assessed the association of patient and physician characteristics on the odds of experiencing clinical inertia and the amount of the variance in clinical inertia that can be attributed to the patient vs the physician. The dependent variable is a binary variable indicating whether clinical inertia was present ≥1 times during the study period. Physician and patient characteristics of interest were included in the model as independent variables. The second model examined the association of experiencing clinical inertia on the probability that the patient had uncontrolled hypertension at the end of the study period. The dependent variable was an indicator variable for whether the patient's BP was well controlled at the last visit during the study period. The primary independent variable of interest was whether patients experienced clinical inertia during the study period. Physician and patient characteristics were also included. This study was approved by the University of Florida's institutional review board.

RESULTS

Overall, 66% of all patients who were newly diagnosed with hypertension during the study period experienced clinical inertia at least once, with 53% of newly diagnosed patients also having uncontrolled hypertension at the last visit during the study period. Characteristics of the patients and their treating physicians, grouped by presence of clinical inertia, are presented in Table I.

The multivariate analysis examining clinical inertia is presented in Table II. Patient volume was the only physician characteristic associated with clinical inertia (odds ratio [OR]=0.998, P=.04). In fact, only 0.98% of the variance in clinical inertia could be attributed to the treating physician. However, there were several patient characteristics that were associated with clinical inertia. Older patients were more likely to experience clinical inertia, with the odds of experiencing clinical inertia increasing by 2% with every year of age (OR=1.02, P<.001). Obese patients had 81% greater odds of

TABLE I. Physician and Patient Characteristics by Presence of Clinical Inertia

	Overall	Clinical Inertia	
		Yes	No
Clinical inertia, %	65.9	–	–
Physician characteristics			
Age, y	48.8	48.9	48.7
Male sex, %	83.9	83.2	85.4
Physician type			
Internal medicine, %	55.0	55.3	54.3
Family medicine, %	37.5	37.1	38.3
Other specialty, %	7.5	7.6	7.4
Years in practice	18.0	18.0	17.9
Monthly patient volume[a]	317.9	314.4	324.7
Patient characteristics			
Age, y[a]	67.3	68.5	65.0
Male sex, %	47.3	46.8	48.3
Active smoker, %	4.8	4.4	5.5
Latino, %[a]	2.1	2.5	1.3
BMI category[a]			
Underweight, %	0.4	0.3	0.6
Normal, %	9.7	9.2	10.7
Overweight, %	27.1	26.9	27.4
Obese, %	47.5	51.5	39.9
Unknown BMI, %	15.3	12.1	21.5
Index systolic pressure[a]	139.2	140.8	136.2
Index diastolic pressure	81.6	81.9	81.0
Any comorbidities, %[a]	10.1	8.6	12.9
Seeing PCP and specialist, %	37.4	36.9	38.2
Visits in study period, No.	23.5	23.6	23.4
Hospitalizations in study period, No.[a]			
None	70.1	68.7	72.9
One	17.9	18.3	17.2
More than one	11.9	13.0	9.9
Type of insurance[a]			
Commercial, %	66.3	62.7	73.1
Medicare/Medicaid, %	33.7	37.3	26.9

Abbreviations: BMI, body mass index; PCP, primary care physician.

[a]Significant difference between patients who did and did not experience clinical inertia.

TABLE II. Physician and Patient Factors Associated With Clinical Inertia

	Odds Ratio	*P* Value	95% CI	
Physician characteristics				
Age	0.997	.892	0.954	1.042
Male sex	0.972	.882	0.668	1.415
Physician specialty				
Internal medicine (ref)	–	–	–	–
Family medicine	0.910	.477	0.701	1.180
Other specialty	0.978	.925	0.614	1.557
Years in practice	0.999	.970	0.958	1.043
Patient volume per month	0.998	.040	0.997	1.000
Patient characteristics				
Age	1.021	<.001	1.013	1.029
Male sex	1.074	.374	0.917	1.259
Active smoker	0.742	.104	0.517	1.063
Latino	1.785	.067	0.960	3.320
BMI				
Underweight	0.768	.654	0.243	2.434
Normal (ref)	–	–	–	–
Overweight	1.189	.230	0.896	1.579
Obese	1.805	<.001	1.375	2.369
Unknown BMI	0.592	.002	0.425	0.826
Index systolic pressure	1.011	.001	1.004	1.017
Index diastolic pressure	1.005	.341	0.994	1.016
Any comorbidity	0.591	<.001	0.461	0.759
Saw PCP and specialist	0.906	.228	0.772	1.063
Visits, No.	1.002	.488	0.997	1.007
Hospitalizations, No.				
None (ref)	–	–	–	–
One	1.031	.775	0.838	1.268
More than one	1.263	.075	0.976	1.635
Type of insurance				
Medicare/Medicaid (ref)	–	–	–	–
Commercial	0.804	.029	0.661	0.977

Abbreviations: BMI, body mass index; CI, confidence interval; PCP, primary care physician; ref, reference.

experiencing clinical inertia relative to normal-weight patients (OR=1.81, *P*<.001). Patients with unknown BMI, however, had almost half the odds of experiencing clinical inertia relative to normal-weight patients (OR=0.59, *P*=.002). Patients with a comorbidity also had lower odds of experiencing clinical inertia (OR=0.59, *P*<.001). Additionally, higher systolic pressure at the index visit was associated with greater odds of experiencing clinical inertia during the study period (OR=1.01, *P*=.001). Finally, patients with commercial insurance had lower odds of experiencing clinical inertia compared with patients using Medicare or Medicaid (OR=0.80, *P*=.029).

Next, a multivariate model was estimated to assess the impact of clinical inertia on the odds of having uncontrolled BP at the last visit during the study period (Table III). Experiencing clinical inertia at some point during the study period was associated with 2.9 times the odds of having uncontrolled BP at the last visit of the study period (OR=2.94, *P*<.001), even after controlling for physician and patient characteristics. Although not the focus of the study, one interesting finding among the control variables was that patients with commercial insurance who experienced clinical inertia were significantly less likely to have uncontrolled BP at their last visit than patients with Medicare or Medicaid (OR=0.72, *P*=.001).

DISCUSSION

Consistent with other studies,[9,15,16] 66% of patients with newly diagnosed hypertension experienced at least one instance of clinical inertia during the study period. In addition, the negative consequences of clinical inertia were reaffirmed, with patients who experienced clinical inertia having nearly 3 times the odds of having

TABLE III. Association of Clinical Inertia With Uncontrolled Hypertension at Last Visit

	Odds Ratio	*P* Value	95% CI	
Clinical inertia during study	2.935	<.001	2.458	3.504
Physician characteristics				
Age	1.014	.422	0.980	1.050
Male sex	1.085	.562	0.823	1.430
Physician specialty				
Internal medicine (ref)	–	–	–	–
Family medicine	1.140	.160	0.950	1.369
Other specialty	1.040	.844	0.706	1.531
Years in practice	0.982	.289	0.950	1.015
Patient volume per month	0.999	.236	0.998	1.000
Patient characteristics				
Age	0.992	.029	0.984	0.999
Male sex	1.269	.004	1.079	1.492
Active smoker	1.179	.387	0.812	1.711
Latino	1.330	.297	0.778	2.274
BMI				
Underweight	1.505	.532	0.417	5.424
Normal (ref)	–	–	–	–
Overweight	1.105	.500	0.827	1.475
Obese	1.463	.008	1.103	1.941
Unknown BMI	1.617	.007	1.144	2.286
Index systolic pressure	1.015	<.001	1.009	1.021
Index diastolic pressure	1.002	.732	0.993	1.011
Any comorbidity	0.681	.006	0.518	0.897
Saw PCP and specialist	0.986	.859	0.839	1.158
Visits, No.	1.000	.917	0.995	1.005
Hospitalizations, No.				
None (ref)	–	–	–	–
One	0.810	.043	0.660	0.993
More than one	0.772	.042	0.602	0.990
Type of insurance				
Medicare/Medicaid (ref)	–	–	–	–
Commercial	0.717	.001	0.589	0.871

Abbreviations: BMI, body mass index; CI, confidence interval; PCP, primary care physician; ref, reference.

uncontrolled hypertension at their last office visit during the study period. However, clinical inertia was only related to one of the included physician characteristics, and <1% of the variation in clinical inertia could be attributed to physicians. However, this does not necessarily indicate that patients are the cause of clinical inertia. Instead, the study suggests that nearly all physicians have practiced clinical inertia with some of their patients, and patient characteristics are stronger predictors of whether clinical inertia actually occurs in a given physician-patient relationship. Given that patient characteristics are the strongest predictors of clinical inertia, it is possible that physicians are frequently using these characteristics to decide whether to modify therapeutic interventions when uncontrolled hypertension is present. Some possibilities for our findings are that physicians are focusing limited visit time on other medical problems that they view as more pressing, that physicians are looking at chronic uncontrolled hypertension in a nihilistic way and accept its presence, or that in cases of clinical uncertainty, inherent biases are determining when to modify treatment. It is also possible that patient preferences are leading to these findings. For example, higher incidence of clinical inertia among older patients may be the result of older patients not wanting to change their medications and physicians responding to that patient preference.

The strongest predictors of experiencing clinical inertia were patient age and weight, with older patients and obese patients being the most likely to have experienced clinical inertia. Older patients and obese patients are more likely to have more healthcare needs than other patients, and it is possible that physicians are focusing visit time on other conditions that they feel are more pressing than hypertension. However, patients with documented comorbid conditions were significantly less likely to experience clinical inertia, so this explanation seems unlikely. It is also possible that physicians are more likely to tolerate elevated BP levels among older patients[11] and obese patients, as hypertension is common in these populations and physicians either accept this as normal or feel that changing medications will not result in lowered BP.[17] Given that the greater a patient's BP at the index visit, the greater the likelihood of experiencing clinical inertia, this also suggests that a certain degree of treatment nihilism may be present, with physicians accepting a certain level of hypertension among patients with chronic uncontrolled hypertension.

The finding that patients with commercial insurance were less likely to experience clinical inertia compared with patients with Medicaid or Medicare suggests that physician biases toward commercially insured patients compared with patients with Medicaid or Medicare could play a role in clinical inertia. Theories about physician decision making suggest that when a physician faces uncertainty, the physician will resort to intuitive reasoning that relies on cognitive disposition to respond, or biases, where the physician will use patient characteristics to aid with clinical decision making.[18] This type of reasoning can lead to disparities if physicians use information such as insurance status, which is related to age and social status, to make clinical decisions. Alternatively, physicians may be spending less time with patients with Medicaid or Medicare because of concerns about lower reimbursement, which could reduce their likelihood of attending to the modification of hypertension therapies. Finally, another explanation is that patients' treatment preferences may differ by insurance status or by characteristics correlated with insurance status such as disability or income. Thus, the observed difference could be related to physicians considering these preferences and taking a patient-centered approach to treatment choices. This paper cannot confirm these or other potential explanations for the observed relationships, although they offer interesting areas for future inquiry.

Study Limitations

Some limitations of this study need to be considered. First, data are from a single (but large) group practice in Florida, thus results may not be generalizable beyond the practice. However, given that rates of hypertension and clinical inertia found in this practice are consistent with other studies, including national studies, it is likely that this practice is reflective of other practices in Florida and throughout the country. Second, because this study used data extracted from EMRs that used free text for medication names and dosages, it is possible that some changes in medication and dosages recorded were entry errors instead of actual changes. However, the research team went through extensive procedures to remove and/or correct data entry errors, so this issue should be minimal. More generally, like all EMR data, the EMR data used in this study were limited by their lack of complete information about physicians and patients. This prevented the inclusion of other factors in the analysis and may have introduced unobserved confounding in the results. For example, the study data did not allow us to identify patient adherence to their medications. Because prior studies have shown medication nonadherence to be an important factor in clinical inertia,[8] future studies and clinical interventions should consider the role of nonadherence in combination with the factors identified in this study. Also, the study data did not allow us to identify chronic kidney disease and thus apply a lower BP target as indicated by clinical guidelines.[1] However, because patients with stage IV and V chronic kidney disease were excluded, and because many patients with chronic kidney disease also have diabetes, which we did identify, we believe this limitation minimally impacted the results. Finally, values were frequently missing from the medical record for BMI. To retain observations with these missing values, separate categories for missing BMI were included in the analytic models. If individuals with missing values were more likely to fall into one BMI category than another, this could potentially bias the results.

CONCLUSIONS

Despite the limitations discussed above, this study demonstrates that clinical inertia in hypertension treatment remains a problem. This is particularly concerning given that older patients and obese patients are more likely to experience clinical inertia, and are more likely to experience cardiovascular problems independent of their uncontrolled hypertension. Additionally, patients with the most uncontrolled BP are also more likely to experience clinical inertia. One potential solution is provider and/or patient education surrounding this issue, although a previous study found that provider education had no effect on BP control while patient education did result in better BP control.[19] More research on causes of clinical inertia in hypertension should be conducted in the future to help design and implement interventions that can address this persistent problem.

References

1. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension.* 2003;42:1206–1252.
2. Hajjar I, Kotchen T. Regional variations of blood pressure in the United States are associated with regional variations in dietary intakes: the NHANES-III data. *J Nutr.* 2003;133:211–214.
3. Egan BM, Zhao YM, Axon RN. US trends in prevalence, awareness, treatment, and control of hypertension, 1988–2008. *JAMA.*2010;303:2043–2050.
4. O'Connor PJ. Overcome clinical inertia to control systolic blood pressure. *Arch Intern Med.* 2003;163:2677–2678.
5. Okonofua EC, Simpson KN, Jesri A, et al. Therapeutic inertia is an impediment to achieving the healthy people 2010 blood pressure control goals. *Hypertension.* 2006;47:345–351.
6. Kerr EA, Zikmund-Fisher BJ, Klamerus ML, et al. The role of clinical uncertainty in treatment decisions for diabetic patients with uncontrolled blood pressure. *Ann Intern Med.* 2008;148:717–727.
7. Turner BJ, Hollenbeak CS, Weiner M, et al. Effect of unrelated comorbid conditions on hypertension management. *Ann Intern Med.* 2008;148:578–586.
8. Grant R, Adams AS, Trinacty CM, et al. Relationship between patient medication adherence and subsequent clinical inertia in type 2 diabetes glycemic management. *Diabetes Care.* 2007;30:807–812.
9. Crowley MJ, Smith VA, Olsen MK, et al. Treatment intensification in a hypertension telemanagement trial: clinical inertia or good clinical judgment? *Hypertension.* 2011;58:552–558.
10. Berlowitz DR, Ash AS, Hickey EC, et al. Inadequate management of blood pressure in a hypertensive population. *N Engl J Med.* 1998;339:1957–1963.
11. Hyman DJ, Pavlik VN, Vallbona C. Physician role in lack of awareness and control of hypertension. *J Clin Hypertens (Greenwich).* 2000;2:324–330.
12. Oliveria SA, Lapuerta P, McCarthy BD, et al. Physician-related barriers to the effective management of uncontrolled hypertension. *Arch Intern Med.* 2002;162:413–420.
13. Parchman ML, Pugh JA, Romero RL, Bowers KW. Competing demands or clinical inertia: the case of elevated glycosylated hemoglobin. *Ann Fam Med.* 2007;5:196–201.
14. WHO. Global database on body mass index. http://apps.who.int/bmi/index.jsp?introPage=intro_3.html. Accessed May 21, 2012.
15. Madsen LB, Kirkegaard P, Pedersen EB. Blood pressure control during telemonitoring of home blood pressure. A randomized controlled trial during 6 months. *Blood Press.* 2008;17:78–86.
16. Parati G, Omboni S, Albini F, et al. Home blood pressure telemonitoring improves hypertension control in general practice. The TeleBPCare study. *J Hypertens.* 2009;27:198–203.
17. Ong KL, Cheung BMY, Man YB, et al. Prevalence, awareness, treatment, and control of hypertension among United States adults 1999–2004. *Hypertension.* 2007;49:69–75.
18. Croskerry P. Achieving quality in clinical decision making: cognitive strategies and detection of bias. *Acad Emerg Med.* 2002;9:1184–1204.
19. Roumie CL, Elasy TA, Greevy R, et al. Improving blood pressure control through provider education, provider alerts, and patient education – a cluster randomized trial. *Ann Intern Med.* 2006;145:165–175.