Association of Controlled and Uncontrolled Hypertension With Workplace Productivity

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The authors estimated the lost productive time (LPT) due to absenteeism and presenteeism among employees at the Group Health Cooperative with controlled and uncontrolled hypertension compared with normotensive patients. The patients responded to a survey inquiring about health behaviors with links to their medical record to identify diagnoses, blood pressure measurement, and prescription drug dispenses. Individuals with controlled hypertension were more likely to report any LPT relative to individuals with uncontrolled hypertension (40.6% vs 32.6%, $P<.05$). There were no significant differences in the average hours of LPT due to presenteeism among individuals regardless of their hypertension status but individuals with hypertension were more likely to report hours of LPT due to absenteeism compared with normotensive individuals (1.04 vs 0.59 hours; $P=.001$). Individuals with uncontrolled hypertension were more likely to report LPT due to absenteeism compared with individuals with controlled hypertension (1.35 vs 0.72 hours; $P=.001$). There were no significant differences between individuals with hypertension whose blood pressure was controlled and normotensive individuals with respect to the likelihood of reporting any LPT or in the amounts of absenteeism and presenteeism. *J Clin Hypertens (Greenwich).* 2016;18:217–222. © 2015 Wiley Periodicals, Inc.

Healthcare researchers and employers have shown an increasing interest in the impact of highly prevalent and potentially costly chronic conditions on workplace productivity.[1–4] As a result of absence from work (absenteeism), reduced productivity while at work (presenteeism), and short-term disability, indirect costs, or costs that are incurred outside of health services delivery, attributable to chronic conditions account for around 70% of the overall burden of disease directly affecting employers in the United States.[2]

Hypertension is among the most prevalent chronic conditions in the United States and is a primary risk factor for cardiovascular disease, which is the leading cause of death among US adults.[5,6] Hypertension prevalence among American adults is projected to increase from 33.9% in 2010 to 37.3% by the year 2030. Without considering the costs attributable to lost workplace productivity, the indirect costs of hypertension are expected to rise by 69% in the next 2 decades.[7,8]

Although lowering blood pressure (BP) to a recommended level below 140/90 mm Hg[9] substantially reduces the risk of cardiovascular disease,[10–12] hypertension is largely undertreated in the United States.[13,14] Analyses of data from the National Health and Nutrition Examination Survey (NHANES) reveal that only 46% of adults with hypertension in the United States have their condition adequately controlled. While there are a variety of reasons for this outcome,[15] evidence suggests that inadequate access to care and poor adherence to medication regimens both play major roles.[15–17] Despite increasing prevalence rates and inadequate population control, hypertension has received relatively little attention as a focus of health-related workplace productivity studies. Following Goetzel and colleagues,[2] we conducted an unpublished comprehensive literature review and found that little published evidence quantifies workplace productivity loss among individuals with controlled and uncontrolled hypertension. To address this gap in the existing literature, we sought to examine total lost productive time (LPT) at work among individuals without hypertension relative to individuals with both controlled and uncontrolled hypertension.

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METHODS

Research Setting and Population Sample

We examined hypertension-associated workplace LPT among employees of the Group Health Cooperative, a large integrated healthcare delivery system in Washington State with approximately 9000 employees engaged in a wide range of clinical and administrative roles. Most of Group Health's employees receive care from a member of the Group Health Physicians medical group, a multispecialty group practice that provides exclusive care at Group Health's 25 primary and four specialty care centers located in Washington's main population

centers. This research was part of a larger study examining the impact of value-based insurance and incentives for health promotion programs among Group Health employees. In support of this larger study, we administered a survey to a random sample of Group Health employees between February and May 2010. Individuals selected for the survey received a letter informing them of the study and providing them the opportunity to decline participation. Individuals who did not request to be excluded from the study received an e-mail at their workplace address with a link to a Web-based survey. The survey requested sociodemographic information including age, sex, race, education, household income, marital status, height, and weight. Body mass index (BMI) was calculated from self-reported weight and height using the imperial formula [(weight in pounds * 703)/height in inches^2]. For respondents who provided consent, survey data were linked to the individual's medical record from which information on diagnoses made at all healthcare encounters and pharmacy dispenses for prescription drugs as well BP measurements taken at outpatient visits and recorded in the electronic medical record in use at all Group Health outpatient facilities were captured. The study design and all project materials were approved by Group Health's institutional review board.

Work and Health Questionnaire

The survey included all items of the Work Health Questionnaire (WHQ), a self-administered version of the Work and Health Interview.[18] The WHQ measures employees' ratings of their employment status, usual work time, missed full or partial workdays because of illness, and health-related LPT on workdays over a 2-week recall period. Absenteeism is measured as total or partial days of work missed for any health-related reason. Presenteeism is measured as reduced performance while at work by assessing the average amount of work time forgone for a lack of concentration, doing a job over, working more slowly, not working at all, and the time it takes to start working after arriving at the workplace. The WHQ translates presenteeism into hours of lost productivity that—when aggregated with hours missed from work (absenteeism)—provides a measure of total LPT due to personal illness per employee.[18,19]

Hypertension

All patients had at least one BP recorded in their medical record within the year prior to the survey and individuals with hypertension were defined as having one or more of the following criteria during the year prior to the completion of the survey: (1) one or more *International Classification of Diseases—Ninth Revision* (*ICD-9*) diagnosis (401–401.1, 401.9, 402, 403, 403.1, 404, 405, 405.01) of hypertension during any ambulatory encounter, (2) at least one prescription drug for an antihypertensive medication within the following therapeutic classes (including antihypertensive, autonomic or cardiovascular agents or diuretics), or, (3) a BP ≥140/90 mm Hg. *Controlled hypertension* was defined as meeting criteria 1 and 2 with a BP of <140/90 mm Hg, and *normotension* was defined as having neither a diagnosis of hypertension or being prescribed a hypertension-specific drug and having a BP of <140/90 mm Hg. BP readings were obtained from the electronic medical record of each employee who provided consent for the study team to access this information. In previous research, the authors reported that BP is recorded in Group Health's electronic medical record at more than 95% of all adult primary care visits.[20]

Analyses

We used chi-square and unpaired *t* tests to assess differences in socioeconomic and sociodemographic factors between individuals identified as normotensive and hypertensive as well as between individuals with either controlled or uncontrolled hypertension. A generalized linear regression model adjusting for age, sex, race, household income, education, marital status, and BMI was used to estimate absenteeism and presenteeism between and among patients with and without hypertension and with controlled and uncontrolled hypertension. We tested for differences in the degree to which hypertension and hypertension control is associated with absenteeism and presenteeism through analysis of regression adjusted mean values for LPT calculated using the WHQ. Data analysis was generated using SAS/STAT software version 8 of the SAS System for Windows (SAS Institute Inc, Cary, NC).

RESULTS

Between February 18 and May 1, 2010, a random sample of 4995 (77.0% of the total workforce) eligible employees was identified and received an e-mail with a link to the survey. A total of 3583 (71.7%) employees subsequently responded to the survey, of whom 2216 (44.7%) provided consent for the study team to link survey responses with medical records. Among study respondents, the majority were female (78.7%), white (83.2%), and 45 years or older (60.6%). Approximately one third (31.7%, n=702) were identified as having hypertension and of those, 48.4% (n=340) had their condition controlled based on the criteria described above. Survey responders were similar to the overall Group Health employee population, which the Human Resources Department revealed is 80% female and 80% white with a mean age of 45 years.

Sociodemographics and Hypertension

Table I reports sociodemographic characteristics of employees, reported by their hypertension status. Normotensive individuals were more likely to be younger ($P<.001$), white ($P=.015$), and married ($P=.001$) and have a lower household income ($P=.04$), more education ($P<.001$), and lower BMI ($P<.0004$) than individuals with hypertension. Individuals with controlled hypertension were older ($P<.001$) and more likely to be white

TABLE I. Sample Characteristics

Variable	Group			Tests of Difference by Group	
	Normotension	Controlled Hypertension	Hypertension Not in Control	Normotensive vs Hypertensive	Controlled vs Uncontrolled Hypertension
No.	1514	340	362		
Female, %	79.5	80.6	73.6	.23	.089
Age, y					
18–34	20.4	4.4	9.1	<.001	<.001
35–44	24.4	12.9	19.9		
45–64	28.1	25.9	33.4		
55+	23.8	52.4	33.4		
Race					
White	81.0	79.7	75.7	.015	.042
Black/African American	2.2	2.1	7.5		
American Indian/Alaska Native	0.3	0.6	1.4		
Asian	7.7	8.5	6.6		
Native Hawaiian/Pacific Islander	1.3	0.9	1.1		
Other	3.6	3.8	3.9		
Missing	3.3	4.4	3.9		
Education					
High school or less	8.3	10.9	11.6	<.001	.065
Some college	36.0	40.3	49.4		
4-y degree	23.6	20.6	19.1		
More than 4 y	28.5	23.5	16.0		
Household income, $					
≤49K or less	16.4	14.1	25.1	.04	<.001
50–74K	21.1	16.5	20.2		
75–99K	19.5	23.2	20.2		
100–149K	24.6	28.5	18.5		
≥150K	12.7	11.1	8.3		
Marital status					
Married	70.4	69.7	60.5	.001	.01
Divorced, separated, widowed	14.2	20.3	23.5		
Never married	12.1	5.6	12.2		
Body mass index, mean (standard deviation)	26.8 (5.8)	30.5 (7.3)	32.3 (7.7)	<0.001	0.004

($P<.05$), have a higher household income ($P<.001$), married ($P<.01$), and have lower BMI ($P<.001$) than individuals whose hypertension was not in control. Similar results were obtained in comparisons of the hypertensive and nonhypertensive population.

Absenteeism and Presenteeism

Normotensive (32.5%) and hypertensive (36.8%) participants differed significantly ($P<.05$) (Table II) in their likelihood to report any LPT in the 2 weeks prior to the survey. Reported estimates and tests of significance are adjusted for patient characteristics described in the methods section above. Individuals with controlled hypertension were more likely to report any LPT relative to individuals with uncontrolled hypertension (40.6% vs 32.6%, $P<.05$). Mean total hours of presenteeism and absenteeism associated with hypertension for a 2-week recall period are reported in Table III. There were no statistically significant differences in the average hours of LPT due to presenteeism among individuals regardless of their hypertension status but individuals with hypertension were more likely to report hours of LPT due to absenteeism relative to normotensive individuals (1.04 vs 0.59 hours; $P=.001$), and individuals with uncontrolled hypertension were more likely to report LPT due to absenteeism relative to individuals with controlled hypertension (1.35 vs 0.72 hours; $P=.029$).

Additional interpretation of the results reported in Tables II through IV in the percentage reporting any LPT, hours of LPT due to absenteeism, and population-based hours of LPT are driven entirely by individuals whose hypertension was not controlled. Normotensive individuals reported any LPT at essentially the same rate as individuals with controlled hypertension. Similarly, slightly higher hours of LPT due to absenteeism and presenteeism among individuals with controlled hypertension relative to normotensive individuals did not rise to statistically significant levels.

Table IV reports the estimate of the population-based impact per 1000 employees of LPT by hypertension status. To create these estimates we combined the probability of any LPT reported in Table II and the mean hours lost to absenteeism and presenteeism by

TABLE II. Percentage of Respondents Reporting Any Lost Productive Time in Previous 2 Weeks

Group	Percent Reporting Any LPT	*P* Value for Group Difference
Normotension	32.5	.049
All hypertension	36.8	
Controlled hypertension	32.6	.029
Uncontrolled hypertension	40.6	

hypertension status reported in Table III. The significantly greater likelihood that individuals with uncontrolled hypertension reported any LPT as well as the greater number of hours lost to absenteeism relative to individuals with controlled hypertension resulted in an estimated 548.1 (±73.8) hours per 1000 employees that were lost to absenteeism among employees with uncontrolled hypertension as compared with 234.7 (±33.2) among individuals whose hypertension was controlled ($P<.05$). There was a smaller but significant difference in lost hours per 1000 employees due to presenteeism among individuals with uncontrolled compared with controlled hypertension (564.3 [±60.1] vs 414.0 [±42.7]), with the difference primarily driven by individuals with uncontrolled hypertension more likely to report any LPT. Differences in total hours lost per 1000 employees between all individuals with and without hypertension were significant ($P<.05$) for both presenteeism and absenteeism.

DISCUSSION

We assessed lost workplace productivity among employees of a large integrated healthcare system with and without diagnosed, treated, or clinically determined hypertension. Approximately one third of respondents to a random survey of employees were identified as having hypertension, half of whom had their condition controlled. This distribution of hypertension prevalence and control corresponds to data reported from the 2008 NHANES for the overall adult US population.[13] Furthermore, lower rates of control among younger persons, African Americans, and persons with lower household income in our study population mirrors evidence reported in other studies.[21–23]

Individuals with uncontrolled hypertension were significantly more likely to report any LPT as well more LPT due to absenteeism than individuals whose hypertension was controlled. Similarly, all individuals with hypertension were significantly more likely to report any LPT as well greater LPT due to absenteeism than normotensive individuals. Although self-reported LPT due to presenteeism appeared to be greater for individuals with controlled and uncontrolled hypertension compared with normotensive individuals, these differences did not achieve statistical significance. The greater impact of presenteeism on LPT is consistent with other studies reported in the literature, in particular, research reported by Goetzel and colleagues[24] and Loeppke and colleagues.[25]

The increased likelihood of having any LPT for individuals with controlled and uncontrolled hypertension and the greater self-reported hours of LPT in both categories resulted in significantly greater total hours of LPT among these individuals relative to normotensive employees. As reported in Table IV, there were 306 hours of additional LPT per 1000 employees per week with hypertension relative to normotensive employees and 466.7 hours of greater LPT per 1000 employees per week with uncontrolled hypertension relative to employees whose hypertension was controlled. Both of these differences were statistically significant at $P<.05$.

All of the differences between study participants identified as normotensive or hypertensive were driven by the set of individuals whose hypertension was not in

TABLE III. Adjusted Mean (Standard Deviation) Hours of Lost Productive Time in Previous 2 Weeks by Hypertension Status

	Group			Hypertension		
	Normotension	All Hypertension	*P* Value	Controlled	Uncontrolled	*P* Value
Presenteeism	1.15 (31.1)	1.33 (3.38)	.213	1.27 (3.16)	1.39 (3.57)	.649
Absenteeism	59 (2.160	1.04 (3.59)	.001	.72 (2.46)	1.35 (4.39)	.029

TABLE IV. Total LPT in the Previous 2 Weeks per 1000 Employees by Hypertension Status

	Normotension	All Hypertension[a]	Controlled Hypertension	Uncontrolled Hypertension[b]
Presenteeism (95% confidence interval)	373.8±41.9	489.4±51.5	414.0±42.7	564.3±60.1
Absenteeism (95% confidence interval)	191.8±29.1	382.7±54.7	234.7±33.2	548.1±73.8

[a]Differences in lost productive time (LPT) due to presenteeism and absenteeism significantly different at $P<.05$ for normotension and each hypertension group. [b]Differences in LPT due to presenteeism and absenteeism significantly different at $P<.05$ for controlled hypertension and uncontrolled hypertension groups.

control. This suggests the potential cost-savings in LPT at work that might be achieved through better identification, treatment, and management of hypertension among employed individuals.

Our findings contrast with other evidence that has been reported in the literature. Aldana and colleagues[26] investigated the association of modifiable health risks and absenteeism[26] and of the four cross-sectional studies they identified, none reported significant differences in the rates of absenteeism when comparing hypertensive and normotensive patients. Further, Leigh and colleagues[27] did not show any significant association between absenteeism and hypertension as an isolated condition to explain LPT. Similarly, Sullivan and colleagues[28] assessed the effect of cardiometabolic risk factors on expenditures and productivity. When comparing missed work days among normal-weight hypertensive patients with normal-weight normotensive patients, the results did not show statistically significant differences in lost productivity among the two groups.[28] However, when hypertension is considered as one of multiple modifiable risk factors, its marginal probability to account for the variance in absenteeism is greatly enhanced. This pattern is similar for other modifiable health risks such as obesity and hypercholesterolemia.[26]

In order to reduce productivity loss due to chronic conditions and to improve access to medical care, new approaches to health plan benefit design have raised the attention of researchers, employers, and policy makers.[29] Recent literature has established the link between worker health and productivity.[15] Furthermore, the effect of improving productivity when reducing health risks and improving health status has been reported.[30]

STUDY LIMITATIONS AND STRENGTHS

We note several limitations with our findings. First, because of the observational design of our study we cannot report inference with respect to hypertension prevalence and LPT. Second, although the WHQ has been validated to properly assess work absence and reduced productivity while at work,[18] our analyses of absenteeism and presenteeism are based only on this self-reported measure. Further, the analyses did not include adjustment for comorbidities in the normotensive and hypertensive category. Thus, LPT might have been underestimated. The overall generalizability of our results remains limited as Group Health employees' specific sociodemographic characteristics do not necessarily represent the general workforce in the United States. Further studies are needed to evaluate the long-term impact of mean value–based insurance designs on hypertension control and workplace productivity.

As with any study design that relies on both electronic health information and voluntary responses to a survey, our estimates are subject to two sources of potential bias. First, electronic health data may be imprecise in identifying hypertension prevalence, and, second, responses to the survey may be related to either hypertension diagnosis or treatment or employment status. We cannot be certain about whether our findings are impacted by either of these factors but previous research provides confidence in the degree to which diagnostic, pharmacy,[31] and BP data[20] accurately reflect clinical status within the Group Health delivery system. With respect to response bias on the survey, we note that survey responders were similar to the general population with respect to age, sex, and employment status, based on hourly and exempt employee classification.

While noting these limitations, our findings extend the growing body of literature regarding the association of chronic conditions and workplace productivity. We have shown that hypertension control may be important in preventing LPT in the workplace and employers may pursue programs designed to lower these costs. Programs that are already being used include BP monitoring combined with referral to healthcare resources for employees whose BP is found to be out of control[32] and incentives for better self-directed care including subsidies for exercise programs and weight management services.[33] A strength of this study is that Group Health, being employer, insurer, and health care provider, allowed us to generate the unique data source at the intersection of medical records data and productivity measures.

CONCLUSIONS

This study is of particular value for both employers and policy makers interested in understanding the impact of hypertension on workplace productivity and to design health plans specifically targeted at promoting preventive care, improving medication adherence, improving health status, and eventually reducing the burden of lost productivity.

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