Disparities in Hypertension Control Advice according to Smoking Status

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Abstract

Objectives—Hypertension is the most common modifiable cardiovascular risk factor. Blood pressure (BP) reduction, particularly among smokers, is highly effective at preventing cardiovascular diseases. We examined the association between patient smoking status and hypertension management advice.

Methods—Adults who participated in the 2007 Behavioral Risk Factor Surveillance System with self-reported hypertension were examined (n=51,063). Multivariable logistic regression analysis controlling for age, gender, race/ethnicity, education, marital status, insurance status, body mass index, alcohol use, self-reported general health and survey design were conducted to examine the association between smoking status (never, former, or current) and receipt of hypertension control advice.

Results—After controlling for potential confounders, being a current smoker was significantly associated with lower odds of receiving advice to lower salt intake (Adjusted Odds Ratio, AOR, 0.91 [95% confidence interval=0.84–0.99]), exercise (AOR 0.89 [0.80–0.98]), and to take hypertensive medication (AOR 0.80 [0.66–0.98]) compared to never smokers. However, hypertensive smokers had greater odds of receiving advice to reduce alcohol consumption (AOR 1.23 [1.10–1.45]).

Conclusions—Although healthcare providers are in an optimal position to provide patient education to improve BP control, hypertensive smokers may be less likely to receive important BP control lifestyle modification messages from their healthcare provider than non-smokers.

Keywords

high blood pressure; hypertension; smoking; tobacco; health disparities; epidemiology

INTRODUCTION

Hypertension is the most important modifiable risk factor for coronary heart disease (the leading cause of death in North America), stroke (the third leading cause), congestive heart failure, end-stage renal disease, and peripheral vascular disease (Cherry et al., 2003). Approximately 30 percent of the adult population in the United States (US) has hypertension (Ostchega et al., 2008). The National Cancer Institute and the U.S. Preventive Services Task Force have targeted primary care clinicians as the most important group to provide the nation with preventive screening and counseling for behavioral risk factors such as hypertension (USPSTF, 1996).

Smokers and individuals with hypertension are at greatest risk for negative cardiovascular outcomes, such as heart attacks, and early mortality. (Eddy et al., 2009; Mokdad, 2004; Schroeder, 2005). Thus, one of the groups that physicians should target for lowering their blood pressure (BP) is hypertensive smokers. However, smokers may be a particularly difficult population to reach and treat. For example, smokers are more reluctant to adhere to a physicians' preventive advice than non-smokers and tend to underestimate the health risks associated with smoking (Bell & Kravitz, 2008), which both have been associated with lower likelihood of making a quit attempt (Davila et al., 2009). In addition, physicians who are aware of their patients who smoke may not necessarily provide smoking cessation advice for reasons such as lack of time, fear of confrontation with reluctant patients, fear of stigmatizing from their smoking patients, and beliefs that smokers are not capable or ready to quit smoking (Schroeder, 2005). Thus, physicians may have lower expectations for patients who smoke with regard to likelihood of following recommendations for lowering BP such as dietary modification (Eddy et al., 2009; Schroeder, 2005).

However, little research has examined BP control counseling among smokers with hypertension. Therefore, the purpose of this study was to examine, using data from the 2007 Behavioral Risk factor Surveillance System (BRFSS), the association between smoking status and participant-reported healthcare provider BP control advice among hypertensive adults who have visited their doctor within the past 24 months.

METHODS

Sample

The Centers for Disease Control and Prevention (CDC)'s BRFSS is a state-based system of health surveys established in 1984 to collect standardized information on risk factors for morbidity and mortality, including questions on hypertension control and smoking status. This cross-sectional survey is conducted annually among non-institutionalized adults, age 18 years or older, in all 50 states, the District of Columbia, Puerto Rico, the US Virgin Islands, and Guam (CDC, 2003). Measures related to cardiovascular disease and smoking are notably of high reliability and validity in the BRFSS (Nelson et al,, 2001). The Council of American Survey and Research Organization calculated response rates across states, which ranged from 34.0% to 61.3% with a median response rate of 53.7% (Link et al., 2006; Groves, 2006). The core survey, which is administered in all states includes the question, "Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?"

Outcome Variables

The five dichotomous outcome variables in the present study were self-reported healthcare provider advice to: 1) change eating habits, 2) reduce salt intake, 3) reduce alcohol consumption, 4) exercise, and 5) take hypertensive medication. In the 2007 BRFSS survey, 19 states and territories (AL, CT, DE, DC, FL, GA, KY, LA, MN, MS, MT, NY, NC, OK, SC, TN, UT, VI, WV) included a survey module containing items pertaining to receipt of lifestyle modification advice for individuals with high BP. This module was administered to 51,063 participants who reported in the core survey that they had been told by a healthcare provider that they had high blood pressure (excluding those who only had pregnancy-related hypertension). Specifically participants were asked: "Has a doctor or other health professional ever advised you to do any of the following to help lower or control your high blood pressure?" Response options included advice to: "change your eating habits?; cut down on salt?; reduce alcohol use?; exercise?; and take medication?" During the core survey, demographic, smoking status, and periodic doctor check-up visit questions were asked before the high blood pressure control advice questions.

Independent Variables

The main independent variable in the study was smoking status, which was derived from two items, namely: 1) "Have you smoked at least 100 cigarettes in your entire life?' and 2) "Do you now smoke cigarettes every day, some days, or not at all?" Smoking status was re-coded as: "Smoker" if the respondents reported having smoked at least 100 cigarettes in their lifetime and were current smokers; "never smoker" if they reported they had not smoked at least 100 cigarettes in their lifetime, and "former smoker" if they reported having smoked 100 cigarettes in their lifetime but did not currently smoke. Covariates were: age, gender, race/ethnicity, educational attainment, marital status, health care coverage, body mass index (BMI) [categorized as (1) neither overweight nor obese [<25 kg/m^2]; (2) overweight [$25–29.9$ kg/m^2]; or (3) obese [$>=30$ kg/m^2]; and heavy alcohol drinking (categorized as a dichotomous Yes/No to adult men having more than two drinks per day and adult women having more than one drink per day) (Flowers et al., 2008).

Statistical Analyses

We performed analyses among individuals who had visited a health care provider in the past "24 months" given that not all individuals, particularly young individuals or those uninsured, visit their primary care provider every year. We limited the time frame of having visited a health care provider in the past 24 months in order limit recall bias regarding physician advice. Descriptive statistics of sample characteristics by smoking status are presented in Table 1. Univariable and multivariable logistic regression models tested the association between smoking status and each physician advice outcome measure controlling for the potential confounders (Table 2). An alpha level of 0.05 was considered statistically significant. All analyses were performed using SAS 9.2 statistical software package (SAS Institute, Inc., USA, 2009) with adjustments for sample weights and survey design. This study was approved by the University of Miami, Miller School of Medicine Institutional Review Board.

RESULTS

The sample characteristics of individuals who visited a doctor in the past 24 months by smoking status are shown in Table 1. Participants between the ages of 40–54 years, had completed high school, were divorced, widowed or separated, did not have health insurance, were neither overweight nor obese, or reported heavy alcohol consumption were more likely to be current smokers rather than former or never smokers.

In the univariable logistic regression analyses, being a current smoker was not associated with advice to change eating habits relative to non-smokers (un-adjusted odds ratio, UOR =1.02; 95% Confidence Interval, CI, [0.86–1.19]). However, current smoking was significantly associated with physician advice to reduce alcohol intake (UOR=1.59 [1.32–1.69]), exercise (UOR=0.81 [0.67–0.87]) take anti-hypertension medication (UOR=0.60 [0.47–0.68]), and was slightly associated with advice to cut down on salt consumption (UOR =0.96; [0.81–0.99]),

Change Eating Habits Advice

In the multivariable model (Table 2), smoking status was not significantly associated with healthcare provider advice to change eating habits (Adjusted odds ratio, AOR =1.01; 95% CI [0.90–1.13]. However, individuals 55 years or older vs. 18–39 years old (AOR = 0.71 [0.60–0.83]; women vs. men, (AOR= 0.86 [0.80–0.93]); those who reported being divorced, widowed, or separated (vs. married) AOR = 0.82 [0.76–0.88], and heavy alcohol drinkers vs. non-heavy drinkers AOR =0.75 [0.63–0.91] were significantly less likely to receive such advice. However, non-Hispanic Blacks (AOR= 1.44 [1.28–1.62]) and Hispanics (AOR= 1.31 [1.101–1.70]) vs. non-Hispanic Whites, and overweight (AOR= 1.48 [1.35–1.63]) or obese (AOR= 2.66 [2.41–2.93]) vs. healthy weight participants, and those reporting fair or poor health (AOR= 1.19 [1.10–1.30]) vs. excellent to good health were more likely to receive advice to change their eating habits.

Salt Reduction Advice

After adjusting for confounders, being a current smoker was significantly associated with lower odds of receiving healthcare provider advice to reduce salt consumption (AOR=0.91; [0.84–0.99]. Other factors associated with lower odds of such advice included being female (AOR= 0.89; [0.82–0.97]; having a 4-year college degree (AOR= 0.73 [0.63–0.84]), and heavy alcohol consumption (AOR= 0.77 [0.63–0.94]). Factors associated with greater odds for salt reduction advice included being non-Hispanic Black (AOR= 1.61 [1.42–1.84]) or Hispanic (AOR= 1.63 [1.22–2.19]), being overweight (AOR= 1.31 [1.19–1.45]) or obese (AOR= 1.60 [1.45–1.78]), and fair or poor health (AOR= 1.35 [1.24–1.48]).

Alcohol Reduction Advice

After adjusting for confounders, being a current smoker was significantly associated with greater odds of receiving healthcare provider advice to reduce alcohol consumption (AOR= 1.26 [1.10–1.45]). Other factors associated with greater odds of alcohol reduction advice included non-Hispanic Black (AOR= 1.63 [1.40–1.90]) or Hispanic race/ethnicity (AOR= 2.49 [1.83–3.38]), being overweight (AOR= 1.24 [1.09–1.42]) or obese (AOR= 1.44 [1.26–1.64]), and reporting fair or poor health (AOR=1.43 [1.28–1.60]).

Exercise Advice

After adjusting for confounders, being a current smoker was significantly associated with lower odds of receiving healthcare provider advice to exercise (AOR= 0.89 [0.80–0.98]). Other factors associated with lower odds of exercise advice included being 55 years of age or older (AOR= 0.81 [0.67–0.98]), female gender (AOR= 0.91 [0.84–0.99]), and being divorced, widowed, or separated (AOR= 0.77 [0.71–0.83]). Factors associated with greater odds for such advice included non-Hispanic Black race/ethnicity (AOR= 1.27 [1.12–1.45]), being overweight (AOR= 1.55 [1.40–1.71]) or obese (AOR= 2.45 [2.20–2.73]), and having graduated high school (AOR= 1.24 [1.10–1.41]).

Medication Advice

After adjusting for confounders, being a current smoker was significantly associated with lower odds of receiving healthcare provider advice to take medication (AOR= 0.80 [0.66–0.98]),

which was also lower among alcohol drinkers (AOR= 0.78 [0.59–0.99]). Greater odds of receiving medication advice was related to having health care coverage (AOR= 1.50 [1.19–1.89]), being overweight (AOR= 1.39 [1.16–1.68] or obese (AOR= 2.16 [1.78–2.63]), and reporting fair or poor health (AOR= 1.55 [1.30–1.83]).

DISCUSSION

In this study of US adults who reported being diagnosed with hypertension and who visited a healthcare provider in the past 24 months, we found that current smokers were less likely than non-smokers to receive advice from their healthcare provider to reduce salt intake, exercise, and take hypertensive medication. Current smokers were more likely to receive advice to reduce alcohol consumption. To our knowledge, no previous studies have tested the association between smoking status and receiving general hypertension management advice among adults with hypertension. Our findings are consistent with studies suggesting that physicians may not always provide smokers with needed health advice, for example smoking cessation advice (Schroeder, 2005; Thorndike et al., 1998; Thorndike et al., 2007;)

Other factors that were associated with lower odds of receiving more than three out of five recommendations for controlling blood pressure included being a female, divorced, widowed, or separated, and being a heavy alcohol drinker. On the other hand, greater odds for receiving high blood pressure control advice were found for non-Hispanic Blacks and Hispanics, those who graduated high school, were overweight or obese, and reported fair or poor general health. Our findings are consistent with previous studies demonstrating that physician advice for the management of hypertension varies as a function of patient socio-demographics characteristics (Damush et al., 1999; Doescher and Saver, 2000; Gu et al., 2008; Honda, 2004; Martin et al., 2006; Samad et al., 2008; Sciamanna et al., 2000). Our findings for race/ethnicity are in agreement with a study of hypertensive women, which reported that Black females were more likely to receive advice for managing hypertension compared to white women (Martin et al., 2006). However, our findings for gender are inconsistent with previous studies that have reported women being more likely to receive advice and be treated for hypertension (Gu et al., 2008) perhaps because women are more likely to adhere to hypertensive management advice and treatment (Gu et al., 2008; Viera et al., 2007).

Thus, our findings indicate that physicians are more likely to provide high blood pressure control advice to some subgroups who experience a greater prevalence of hypertension and worse health outcomes, but may be neglecting smokers and heavy drinkers. However, we are assuming that these physicians are aware their patients are current smokers, which may not be the case. Moreover, the identification of smoking status may vary by participant characteristics such as gender, race/ethnicity, insurance type, and primary diagnosis (Thorndike et al., 1998). Interestingly, the only hypertension advice that was more likely to be given to smokers and alcohol drinkers was alcohol cessation advice. This suggests that physicians may be aware of the comorbid behaviors of smoking and drinking, perhaps due to the health risks and medical outcomes associated with both of these behaviors.

Strengths and Limitations

This study adds to the literature by being among the first to examine associations between hypertension, smoking, and blood pressure control advice using recent population based data across multiple US states. We were also able to rule out the contributions of several important variables (e.g., health insurance status) to these relationships. However, we do note the limitations of this study. First, the cross-sectional design does not allow for causal inferences. Since BRFSS is a telephone based survey, there is the possibility of non-response bias (Link et al, 2006a, b). In addition, there may be medical advice recall bias especially given that we included in our analyses some participants who had last seen their health care provider as long

as 24 months prior to their BRFSS interview. To minimize the possibility of recall bias, we repeated our analyses using 12 months as the cut-off for visiting a doctor, and the pattern of findings was unchanged (not presented). Furthermore, hypertension diagnosis was based on self-report and we did not have data on whether the hypertension was controlled or uncontrolled, which could affect the advice given to the patient. Lastly, we do not know what exactly the providers knew about their patients, including smoking status. Thus, the findings from this study warrant replication.

CONCLUSION

There are well-established causal links between hypertension treatment and patient outcomes as well as more than 25 years of published guidelines for hypertension management. However, the present findings suggest that there remains a gap between recommended and delivered care to hypertensive smokers (Makuc, et al., 1989; Sica, 2008;). This is particularly disconcerting given that cardiovascular outcomes are worse and more costly in hypertensive smokers compared to non-smokers (Eddy et al., 2009). Interventions to improve the rates of BP control advice among hypertensive smokers, without neglecting other needed counseling and medication management activities, are needed.

Acknowledgments

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Table 1

Sample characteristics and prevalence of blood pressure control advice among adults with high blood pressure who visited a doctor in the past 24 months by smoker status: the 2007 Behavioral Risk Factor Surveillance System (n=51,063)

Sample Characteristics	Current Smokers n=8,344*		Former Smokers n=17,942*		Never Smokers n= 24,777*	
	n	%	n	%	n	%
Age in years						
18–39	750	9.0	426	2.4	1,685	6.8
40–54	2,740	32.8	2,596	14.5	5,311	21.4
55 yrs or older	4,857	58.2	14,920	83.2	17,781	71.8
Sex						
Male	3,392	40.4	8,686	48.1	6,842	27.4
Female	5,001	59.6	9,359	51.9	18,134	72.6
Race/Ethnicity						
Non-Hispanic, White	6,250	75.1	14,862	83.2	18,027	73.1
Non-Hispanic, Black	1,444	17.3	2,000	11.2	4,960	20.1
Hispanic	222	2.7	413	2.3	822	3.3
Non-Hispanic, Other race	284	3.4	381	2.1	603	2.4
Non-Hispanic, Multiracial	124	1.5	216	1.2	260	1.1
Education						
Did not graduate High School	1,771	21.2	2,706	15.0	3,645	14.6
Graduated High School	3,158	37.7	5,974	33.2	8,677	34.8
Attended College or Technical School	2,218	26.5	4,726	26.3	5,889	23.6
Graduated from College or Technical School	1,224	14.6	4,591	25.5	6,702	26.9
Marital status						
Married	3,496	41.8	9,963	55.3	12,610	50.6
Divorced, widowed, separated	3,899	46.6	6,995	38.8	10,008	40.2
Others	963	11.5	1,052	5.8	2,292	9.2
Have any health care coverage						
Yes	7,108	84.8	17,060	94.7	23,117	92.7
No	1,276	15.2	960	5.3	1,809	7.3

Sample Characteristics	Current Smokers n=8,344*		Former Smokers n=17,942*		Never Smokers n=24,777*	
	n	%	n	%	n	%
Body Mass Index (BMI)						
Neither overweight nor obese	2,486	30.5	3,746	21.5	5,340	22.5
Overweight	2,905	35.6	6,811	39.2	8,509	35.9
Obese	2,773	34.0	6,835	39.3	9,870	41.6
Heavy Alcohol Consumption						
Yes	652	8.0	761	4.3	486	2.0
No	7,520	92.0	16,898	95.7	24,128	98.0
Self-Reported General Health Status						
Excellent to Good	4,634	55.5	11,682	65.1	17,320	69.8
Fair to Poor	3,717	44.5	6,290	34.9	7,508	30.2
Attempted Smoking Cessation in past 12 months						
Yes	4,735	56.5	--	--	--	--
No	3,642	43.5	--	--	--	--
Hypertension Control Advice Receipt on:						
Change eating habits	5,072	60.8	10,750	60.0	15,415	62.2
Cut down on salt intake	5,422	68.2	11,703	68.7	16,516	70.2
Reduce alcohol consumption	2,429	46.1	3,927	36.0	4,421	36.1
Exercise	5,770	69.3	13,027	73.9	18,497	74.8
Take hypertension medication	7,518	89.9	16,955	94.3	23,140	93.0

*
Differences in sub-total population sample due to item non-response or missing.

Table 2

Univariable and Multivariable Logistic Regression on Five High Blood Pressure Control Advice among adults with hypertension: the 2007 Behavioral Risk Factor Surveillance System

Variables	CHANGE EATING ADVICE			SALT ADVICE			ALCOHOL ADVICE			EXERCISE ADVICE			MEDICATION ADVICE		
	UOR[†]	AOR[‡]	95 % CI	UOR[†]	AOR[‡]	95 % CI	UOR[†]	AOR[‡]	95 % CI	UOR[†]	AOR[‡]	95 % CI	UOR[†]	AOR[‡]	95 % CI
Smoking Status															
Never Smoker	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Former Smoker	0.91	0.99	0.91–1.07	0.95	1.00	0.91–1.09	0.97	1.01	0.91–1.45	0.95	1.02	0.93–1.11	1.50	1.10	1.01–0.22
Current Smoker	1.02	1.01	0.90–1.13	0.96	0.91	0.84–0.99	1.59	1.26	1.10–1.45	0.81	0.89	0.80–0.98	0.60	0.80	0.66–0.98
Age in years															
18–39		1.00			1.00			1.00			1.00			1.00	
40–54		1.11	0.94–1.33		1.19	1.00–1.42		1.22	1.00–1.47		0.98	0.80–1.19		3.57	2.92–4.37
55 yrs or older		0.71	0.60–0.83		1.10	0.93–1.30		0.83	0.69–1.01		0.81	0.67–0.98		8.35	6.84–10.20
Sex															
Male		1.00			1.00			1.00			1.00			1.00	
Female		0.86	0.80–0.93		0.89	0.82–0.97		0.64	0.58–0.70		0.91	0.84–0.99		1.06	0.92–1.23
Race/Ethnicity															
Non-Hispanic, White		1.00			1.00			1.00			1.00			1.00	
Non-Hispanic, Black		1.44	1.28–1.62		1.61	1.42–1.84		1.63	1.40–1.90		1.27	1.12–1.45		1.02	0.83–1.25
Hispanic		1.31	1.01–1.70		1.63	1.22–2.19		2.49	1.83–3.38		1.28	0.94–1.74		0.79	0.53–1.20
Non-Hispanic, Other race		1.24	0.95–1.60		1.23	0.92–1.63		1.49	1.05–2.11		0.94	0.71–1.25		0.67	0.44–0.98
Non-Hispanic, Multiracial		0.80	0.59–1.10		1.20	0.84–1.69		0.74	0.48–1.14		0.94	0.68–1.31		0.63	0.33–1.18
Education															
Did not graduate High School		1.00			1.00			1.00			1.00			1.00	
Graduated High School		1.14	1.02–1.28		0.99	0.87–1.13		1.19	1.01–1.43		1.24	1.10–1.41		1.33	1.04–1.71
Attended College	Technical School		1.15	1.02–1.30		0.83	0.72–0.95		0.90	0.74–1.09		1.37	1.20–1.56		1.17	0.91–1.50
Graduated College	Tech School		1.05	0.92–1.19		0.73	0.63–0.84		0.70	0.58–0.85		0.59	1.39–1.82		1.20	0.93–1.55
Marital status															
Married		1.00			1.00			1.00			1.00			1.00	

Variables	CHANGE EATING ADVICE			SALT ADVICE			ALCOHOL ADVICE			EXERCISE ADVICE			MEDICATION ADVICE		
	UOR[†]	AOR[‡]	95 % CI	UOR[†]	AOR[‡]	95 % CI	UOR[†]	AOR[‡]	95 % CI	UOR[†]	AOR[‡]	95 % CI	UOR[†]	AOR[‡]	95 % CI
Divorced, widowed, separated		0.82	0.76–0.88		0.92	0.85–1.00		0.94	0.84–1.01		0.77	0.71–0.83		1.01	0.85–1.19
Others		1.01	0.86–1.17		1.02	0.86–1.20		1.22	1.02–1.47		0.88	0.74–1.04		0.81	0.64–1.02
Have any health care coverage															
No		1.00			1.00			1.00			1.00			1.00	
Yes		0.87	0.74–0.99		1.07	0.91–1.26		0.91	0.75–1.11		1.07	0.91–1.25		1.50	1.19–1.89
Body Mass Index (BMI)															
Healthy Weight		1.00			1.00			1.00			1.00			1.00	
Over weight		1.48	1.35–1.63		1.31	1.19–1.45		1.24	1.09–1.42		1.55	1.40–1.71		1.39	1.16–1.68
Obese		2.66	2.41–2.93		1.60	1.45–1.78		1.44	1.26–1.64		2.45	2.20–2.73		2.16	1.78–2.63
Heavy Alcohol Consumption															
No		1.00			1.00			1.00			1.00			1.00	
Yes		0.75	0.63–0.91		0.77	0.63–0.94		1.29	1.06–1.58		0.87	0.71–1.07		0.78	0.59–0.99
Self-Reported General Health Status															
Excellent to Good		1.00			1.00			1.00			1.00			1.00	
Fair or Poor		1.19	1.10–1.30		1.35	1.24–1.48		1.43	1.28–1.60		0.98	0.89–1.06		1.55	1.30–1.83

[†] UOR= Unadjusted odds ratio, the 95% confidence interval, CI, is shown in the results section due to lack of space in table.

[‡] AOR = Adjusted odds ratio, its 95% CI is shown in this table.