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ORIGINAL ARTICLE

Racial differences in smoking abstinence rates in a multicenter, randomized, open-label trial in the United States

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Abstract
Background This study evaluates differences in smoking abstinence between white and minority smokers using pharmaceutical aids.
Methods This is an analysis of data from a multi-center, randomized, clinical trial conducted in the United States. Of the 1,684 subjects randomized to one of three medications (nicotine inhaler, bupropion, or a combination of both), 60% were women and 10% were minority races.
Results Factors associated with a decreased likelihood of smoking at 12 weeks were older age (OR = 0.971, p< 0.0001), being married (OR = 0.678, p=0.0029), using bupropion SR (OR = 0.480, p<0.0001), and using combination therapy (OR = 0.328, p<0.0001). Factors associated with an increased likelihood of smoking were higher tobacco dependence scores (OR = 1.244, p<0.0001), prior quit attempts (OR = 1.812, p=0.004), and being a minority (OR = 1.849, p=0.0083). Compared to white smokers, minority smokers were significantly older at time of study entry (46 vs. 42 years, p<0.0001), less likely to be married (35% vs. 59%, p<0.0001), older at smoking initiation (21 vs. 19 years of age, p<0.0001), and had a lower abstinence rate (16% vs. 26%, p=0.0065).
Conclusion Regardless of the treatment used, minority smokers in the US have lower smoking abstinence after treatment for tobacco dependence. Future research should focus on the improvement in treatment strategies for minority smokers.

Keywords Smoking abstinence · Minority smokers · Tobacco

Abbreviations

BMI	Body Mass Index
CO	carbon monoxide (expired air)
COPD	chronic obstructive pulmonary disease
FCTC	WHO Framework Convention on Tobacco Control
FTND	Fagerström test of nicotine dependence
HSQ	Health Status Questionnaire
NCCTG	North Central Cancer Treatment Group
NCI	National Cancer Institute
NIH	National Institutes of Health
MAOI	monoamine oxidase inhibitor
PPM	parts per million
TQD	target quit day
USPHS	United States Public Health System Service

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Introduction

Globally, about one in three men smoke, and one in ten adults die annually from tobacco-related diseases. As the smoking rates in the developed countries continue to reduce, the rate in developing countries continues to rise (World Health Organi-

zation 2002). Indeed, part of the preamble to the WHO Framework Convention on Tobacco Control (FCTC) discusses the "deep concern about the escalation in smoking and other forms of tobacco consumption by indigenous populations and other minority groups worldwide." The FCTC also mentions the "need to take measures to promote the participation of indigenous individuals and communities in the development, implementation and evaluation of tobacco control programs that are socially and culturally appropriate to their needs and perspectives" (World Health Organization 2000).

Currently, 19.8% of Americans or one out of every four Americans is a current smoker (Centers for Disease Control and Prevention 2008). Unfortunately this statistic does not apply equally to all races living in the USA. The smoking rate in the USA can vary from 12% to 33% depending on the race of the smoker. This translates to one out of every four white Americans, one out of every four African Americans, two out of every three American Indians/Alaskan Natives, and one out of eight Asian Americans being smokers (American Lung Association et al. January 2006; Center for Disease Control and Prevention 2006). Although over 70% of all smokers indicate a desire to stop smoking, it is noteworthy that African-American adults, who smoke fewer cigarettes and have more frequent quit attempts than white smokers (49% vs. 40%, respectively), are less successful (8% vs. 14%, respectively) in achieving smoking abstinence than white smokers (Center for Disease Control and Prevention 1993). Whether this is attributable to differences in nicotine metabolism (Murray et al. 2001) or environmental circumstances is unknown, but the fact remains that despite smoking fewer cigarettes per day, African Americans are 50% more likely to die from lung cancer than their white counterpart (US Department of Health and Human Services 1998).

An earlier study that offered a nicotine inhaler, bupropion SR, or a combination of both for 12 weeks to smokers wishing to stop smoking (Croghan et al. 2007) observed that smokers assigned to the combination therapy were more likely to be abstinent than those assigned to individual therapies. However, this study also showed that the smoking abstinence rate for minority smokers was significantly lower than that of the white smokers. The purpose of this current report is to analyze the study data as they relate to minority smokers enrolled in the open-label phase of this study.

Methods

Study subjects

This study recruited smokers from 19 different cities of the North Central Cancer Treatment Group (NCCTG). The NCCTG is a large cooperative group of oncology practices throughout the USA that performs multiple clinical trials in oncology patients. A total of 1,708 smokers were recruited from the general population, and 1,700 were randomized to the study.

Among these 1,700 smokers, 16 were of Hispanic ethnicity, and 1,684 were non-Hispanic. Of the 1,684 non-Hispanic smokers, 1,512 were white and 172 were minority races (138 were African American and 34 were other races, including Asian-American, American Indian, and Hispanic-American).

Study design

This report is a subanalysis of a larger study involving three study phases. The first phase included 12 weeks of open-label medication to measure efficacy; the second phase assessed blinded relapse prevention or blinded re-treatment; finally, a third phase was the post-medication follow-up. Methodology and results of this larger study have been reported previously (Croghan et al. 2007).

This current report focuses only on the 1,684 non-Hispanic participants who received the first 12 weeks of medication. Study participants were randomized to receive one of three treatment assignments for 12 weeks: 300 mg of bupropion SR per day (150 mg bid), *ad libitum* use of a nicotine inhaler (up to 16 cartridges per day), or a combination of both the nicotine inhaler and bupropion. The primary endpoint for the study was the smoking status at the end of the treatment period.

Study entry criteria

Potential subjects were eligible for enrollment if they were at least 18 years of age, had smoked at least ten cigarettes/day for at least 12 months, were motivated to use the study medication according to the study protocol, were in general good health, had the ability to participate in all aspects of the study, and provided written informed consent. Potential subjects were excluded if they were pregnant/breast-feeding, using concurrent behavioral/pharmacologic treatments to stop smoking, using tobacco products other than cigarettes, or taking an investigational drug. Subjects were also excluded if they had a known hypersensitivity/allergy to nicotine, bupropion, or menthol, unstable angina/myocardial infarction, a history of bulimia/anorexia nervosa, seizure disorders, serious head trauma or other predisposing factors to seizure, or chemical dependence on any drug other than nicotine in the past year. Subjects were also excluded if they were using antipsychotics, antidepressants, theophylline, systemic steroids, antiepileptic medications, or a monoamine oxidase inhibitor (MAO-I).

Recruitment and enrollment

Recruitment for this large study included smokers contacting their regional North Central Cancer Treatment Group site and undergoing a telephone pre-screen, consent visit and a screening visit. If the smoker was found to be eligible, they were randomized to one of three medications. After randomization, participants returned for study visits at week 4, week 8, and week 12 post-randomization. The subjects were instructed to abstain from smoking upon awakening on the target quit date. All subjects received the NCI "Clearing the Air" booklet and individual counseling based on the "Smoke Free and Living It" manual© (Mayo Clinic Nicotine Research Program 2000).

Study measures

The National Institutes of Health (NIH) define *ethnicity* as the sociological constructs that emphasize the cultural aspect of a group of people, and *race* is defined as a biological aspect of a group of people (Crews and Bindon 1991; O'Neil 2008). This study uses this definition, which distinguishes between someone's ethnic origins ("Hispanic origin" and "Not of Hispanic origin") and race ("American Indian or Alaskan Native," "Asian or Pacific Islander," "Black or African American," and "White") (Executive Office of the President et al. 2007).

Severity of nicotine dependence was assessed at baseline using the Fagerström Test of Nicotine Dependence (FTND) (Heatherton et al. 1991). Scores for this measure can range from 0 to 10, with a score of 6 or higher indicating severe nicotine dependence (Fagerström 1978). The Health Status Questionnaire (HSQ) (Ware and Sherbourne 1992) is a 39-item instrument comprised of the original SF-36 items plus three additional items used to screen for depression (Radosevich et al. 1994). The SF-36 is a global assessment of health concepts that represent basic human values relevant to functional status and well-being (Ware et al. 1993). Alcohol dependence was assessed using the Self-Administered Alcoholism Screening Test (SAAST) (Hurt et al. 1980).

Abstinence from smoking was defined as a self-report of nonsmoking for the previous 7 days and was considered to be biochemically confirmed with an expired air carbon monoxide value below eight parts per million (ppm). If the participant failed either of these two conditions (reported any smoking in the previous 7 days or had a CO greater than 8 ppm) then the participant was categorized as a smoker. In order to produce a conservative estimate of smoking abstinence, study outcome data were analyzed in an intent-to-treat model. If a participant failed to complete a visit for whatever reason (missed a visit or terminated early from the study), the participant was classified as a smoker for that incomplete visit.

Randomization and statistical analysis

Randomization was performed using the Pocok-Simon approach, which is a dynamic allocation procedure that balanced the marginal distributions of the stratification factors between treatment groups (Pocock and Simon 1975). Stratification factors were: site, gender, number of cigarettes smoked per day (10–39 vs. 40 or more), and number of years smoked (<5, 5–9, >9). Randomization assigned subjects to one of three medications.

Demographics and smoking abstinence rates at 12 weeks were compared using chi-square tests for categorical variables and ANOVA for continuous variables. Comparisons were done between blacks and other minorities to determine if minorities were similar enough to be combined in the main analyses. The main analyses were comparisons between whites and the combined minorities.

The primary endpoint of this study was the week 12, 7-day point-prevalence, biochemically confirmed, smoking abstinence rate. These cessation rates were tested using two-sided chi-squared tests. With about 172 minorities and over 1,500 whites, this study had 80% power to detect a clinically significant 10% point difference in smoking abstinence rates between the two groups (assuming a baseline success rate of 25% for each of the treatments).

Logistic regression

Smoking cessation rates at week 12 were modeled using logistic regression. First, bivariate logistic regression models were fit for each explanatory variable. Then stepwise logistic regression models were used to identify variables prognostic for smoking cessation. Variables were added to the model one at a time in a stepwise method with an inclusion significance level of 0.05. Variables included for selection in the logistic models were minority, treatment arm, age, age started smoking, years smoked, gender, education, marital status, number of cigarettes smoked per day, depression status, FTND, body mass index (BMI), previous quit attempts, previous use of nicotine replacement, and the longest duration of smoking abstinence. To assess whether differences between race groups were dependent on treatment, the race-by-treatment interaction effect was added to the final model determined using the stepwise approach.

Results

Of the 1,684 smokers analyzed for this report, 172 (10%) were of the four minority races, and 1,512 (90%) were white. A comparison of demographics and abstinence rates

between black and other minorities showed that no significant difference existed between the diverse minorities enrolled in this study. The results in Table 1 show that blacks and other minorities were not significantly different on any of the baseline characteristics or in smoking abstinence rates. The smoking abstinence rates at end of medication were 25% (2/8) for the Asians, 16% (22/138) for the African Americans, 11% (2/19) for the Native Americans, and 29% (2/7) for the other participants. For this reason and in order to increase our study power, we combined the four minority populations and made a larger comparison of the minority population with the white smokers.

Table 2 presents the demographics of this study population. In comparison to whites, minority smokers were significantly older in age at the time of study entry (46 years of age versus 42 years of age, minorities and white, respectively, $p<0.0001$), less likely to be married (35% versus 59%, minorities and white, respectively, $p<0.0001$), older when they began smoking (22 years of age versus 19 years of age, minorities and white, respectively, $p<0.0001$), smoked fewer cigarettes per day at baseline (19 versus 24, minorities and white, respectively, $p<0.0001$), and were less likely to have stopped smoking at the end of the 3 months of medication treatment (16% abstinent versus 26% abstinent, minorities and white, respectively, $p=0.0065$). Figure 1 shows abstinence rates by race within each treatment arm.

Bivariate logistic model results

Smoking abstinence rates at week 12 were modeled using bivariate logistic models as shown in Table 3. Variables independently associated with lower abstinence rates were: smoking 40 or more cigarettes per day at baseline (OR = 1.498, $p=0.0396$), an FTND score (OR = 1.197, $p<0.0001$), major depression (OR = 1.357, $p=0.0408$), ever attempted to stop smoking before this study (OR = 1.853, $p=0.0011$), and being a minority race (OR = 1.781, $p=0.0072$). Variables associated with higher abstinence rates were treatment (bupropion OR = 0.489, combination OR = 0.323, $p<0.0001$), age (OR = 0.976, $p<0.0001$), age started smoking (OR = 0.976, $p=0.0070$), being married (OR = 0.623, $p<0.0001$), and having quit smoking before this study for at least 1 day (OR = 0.601, $p=0.0083$).

Multivariate logistic model results

A multivariate logistic regression model (Table 4) showed that when controlling for all other significant factors, the following were found to be predictive of smoking abstinence after 12 weeks of pharmacotherapy: the younger the age, the greater was the likelihood to be abstinent (OR = 0.971, $p<0.0001$); those who were married were more likely to be abstinent from smoking (OR = 0.678, $p=0.0029$); using bupropion was associated with greater abstinence from smoking (OR = 0.480, $p<0.0001$); using a combination of bupropion and nicotine inhaler was also associated with greater abstinence from smoking (OR = 0.328, $p<0.0001$); conversely, the higher the FTND score, the greater the likelihood to be a continuing smoker (OR 1.244, $p<0.0001$); having any prior quit attempts indicated greater likelihood to be a continuing smoker (OR = 1.812, $p=0.004$); being a minority was associated with continued smoking (OR = 1.849, $p=0.0083$).

In order to assess whether differences between race groups was dependent on treatment, an initial model was fit that included all main effect terms along with the race-by-treatment interaction effect. From this analysis the race-by-treatment interaction was not found to be statistically significant ($p=0.8113$). Therefore, the findings presented here are from the model that includes only main effect terms.

Discussion

Main findings

Our study compared the nicotine inhaler and bupropion versus the combination of the two in a large number of smokers, of which 10% were minority smokers. We observed that minority smokers were less likely to stop smoking at the end of 12 weeks of treatment when compared to white smokers. This is consistent with current US data indicating that overall smoking abstinence rates among white smokers is higher than that of the minority smokers who are trying to quit (Croghan et al. 2008a; U.S. Department of Health and Human Services 1998).

Predictors of smoking abstinence at end of treatment (12 weeks) include younger age at the time of the quit attempt, being married at the time of study participation (and quit attempt), less severe tobacco dependence based on lower FTND scores, fewer past smoking quit attempts, using bupropion (either alone or in combination with inhaler), and being white. Demographics of the study population indicate that at the time of enrollment, minority subjects enrolled in this study were more likely to be older and less likely to be married. Minority smokers enrolled in our program also reported being older when they started smoking and smoking fewer cigarettes per day at time of study enrollment.

In our study we did not find any evidence to suggest that treatment efficacy differed according to race (i.e., no

Table 1 Demographics of blacks versus other minorities

	Black (N=138)	Other (N=34)	Total (N=172)	p value
Age				0.0688
Mean (±SD)	47.1 (10.37)	43.2 (14.38)	46.3 (11.33)	
Gender				0.2738
Female	91 (65.9%)	19 (55.9%)	110 (64%)	
Male	47 (34.1%)	15 (44.1%)	62 (36%)	
Marital status				0.0846
Missing	1	0	1	
Never married	31 (22.6%)	5 (14.7%)	36 (21.1%)	
Married	42 (30.7%)	18 (52.9%)	60 (35.1%)	
Separated/divorced/widowed	62 (45.3%)	10 (29.4%)	72 (42.1%)	
Other	2 (1.5%)	1 (2.9%)	3 (1.8%)	
Education				0.2989
Missing	1	0	1	
Less than HS	6 (4.4%)	3 (8.8%)	9 (5.3%)	
HS or greater	131 (95.6%)	31 (91.2%)	162 (94.7%)	
Age started smoking				0.1071
Mean (±SD)	22.0 (±7.00)	19.8 (±7.51)	21.5 (±7.14)	
Month 0: CPD				0.1355
Mean (±SD)	18.5 (±8.90)	21.1 (±9.40)	19.0 (±9.03)	
Years smoking cigarettes				0.4394
Mean (±SD)	25.1 (±10.42)	23.4 (±14.87)	24.8 (±11.42)	
Ever tried to stop smoking				0.7615
Missing	1	1	2	
1: Yes	119 (86.9%)	28 (84.8%)	147 (86.5%)	
2: No	18 (13.1%)	5 (15.2%)	23 (13.5%)	
Number of times tried to stop				0.4487
Mean (±SD)	3.9 (±3.76)	3.3 (±3.66)	3.8 (±3.74)	
Overall Fagerström score				0.5900
Mean (±SD)	5.8 (±1.88)	5.6 (±2.12)	5.7 (±1.93)	
Fagerström groups				0.2584
Missing	5	0	5	
1–4 (low)	34 (25.6%)	12 (35.3%)	46 (27.5%)	
5–6 (med)	55 (41.4%)	9 (26.5%)	64 (38.3%)	
≥7 (high)	44 (33.1%)	13 (38.2%)	57 (34.1%)	
HSQ major depression				0.3641
Missing	3	2	5	
No	104 (77%)	27 (84.4%)	131 (78.4%)	
Yes	31 (23%)	5 (15.6%)	36 (21.6%)	
HSQ mental composite month 3 minus baseline				0.5341
Mean (±SD)	1.8 (±7.97)	-0.3 (±7.15)	1.3 (±7.72)	
HSQ physical composite month 3 minus baseline				0.0984
Mean (±SD)	3.3 (±6.64)	-1.9 (±8.52)	2.1 (±7.31)	
Week 12: confirmed nonsmoker				0.8094
No	116 (84.1%)	28 (82.4%)	144 (83.7%)	
Yes	22 (15.9%)	6 (17.6%)	28 (16.3%)	
Arm				0.5034
Nicotine inhaler	42 (30.4%)	8 (23.5%)	50 (29.1%)	
Bupropion	54 (39.1%)	17 (50%)	71 (41.3%)	
Combination treatment	42 (30.4%)	9 (26.5%)	51 (29.7%)	

Table 2 Demographics of study population*

	Minority (N=172)	White (N=1,512)	Total (N=1,684)	p value
Age at randomization (*mean ± SD*)	46.3 (±11.33)	42.4 (±11.49)	42.8 (±11.53)	<0.0001
Gender				0.2278
Female	110 (64.0%)	895 (59.2%)	1005 (59.7%)	
Male	62 (36.0%)	617 (40.8%)	679 (40.3%)	
Marital status				<0.0001
Never married	36 (21.1%)	211 (14%)	247 (14.7%)	
Married	60 (35.1%)	894 (59.3%)	954 (56.9%)	
Separated/divorced/widowed	72 (42.1%)	381 (25.3%)	453 (27%)	
Other	3 (1.8%)	21 (1.4%)	24 (1.4%)	
Education				0.1747
Less than HS	9 (5.3%)	63 (4.2%)	72 (4.3%)	
HS or greater	162 (94.7%)	1,410 (94%)	1,572 (94.1%)	
Other	0 (0%)	27 (1.8%)	27 (1.6%)	
Age started smoking (*mean ± SD*)	21.5 (±7.14)	18.7 (±5.85)	19.0 (±6.05)	<0.0001
Cigarettes per day at baseline (*mean ± SD*)	19.0 (±9.03)	23.6 (±9.84)	23.2 (±9.86)	<0.0001
Years of regular smoking (*mean ± SD*)	24.8 (±11.42)	23.7 (±11.20)	23.8 (±11.22)	0.2414
Any prior quit attempts	147 (86.5%)	1,299 (86.3%)	1,446 (86.3%)	0.9383
Prior quit attempts (*mean ± SD*)	3.8 (±3.74)	3.4 (±3.87)	3.4 (±3.86)	0.2271
Overall Fagerström score (*mean ±SD*)	5.7 (±1.93)	5.8 (±2.16)	5.8 (±2.14)	0.5157
Fagerström score				0.2341
1–4 (low)	46 (27.5%)	408 (27.6%)	454 (27.6%)	
5–6 (med)	64 (38.3%)	478 (32.4%)	542 (33.0%)	
≥7 (high	57 (34.1%)	590 (40%)	647 (39.4%)	
HSQ: major depression	36 (21.6%)	296 (20.3%)	332 (20.5%)	0.7096
HSQ mental composite: month 3–baseline (*mean ± SD*)	1.3 (±7.72)	-1.2 (±8.46)	-1.1 (±8.43)	0.1144
HSQ physical composite: month 3–baseline (*mean ± SD*)	2.1 (±7.31)	1.2 (±6.93)	1.3 (±6.95)	0.5015
Smoking abstinence at month 3 (week 12)	28 (16.3%)	389 (25.7%)	417 (24.8%)	0.0065
Treatment arm				0.0672
Nicotine inhaler	50 (29.1%)	512 (33.9%)	562 (33.3%)	
Buproprion	71 (41.3%)	491 (32.5%)	562 (33.4%)	
Nicotine inhaler + bupropion	51 (29.7%)	509 (33.7%)	560 (33.3%)	

*Study population for this report is limited to those not of Hispanic origin

treatment-by-race interaction). However, minority smokers may be less accepting of nicotine replacement products than white smokers (Fu et al. 2005). Latino smokers have been observed to use pharmaceutical aids less often than white smokers (Levinson et al. 2004). Because drug accountability was not collected in our study, we cannot assess for this. However, we did demonstrate that the two treatments were predictive of smoking abstinence in minority smokers. This is similar to another report where bupropion with active nicotine gum or bupropion with placebo nicotine gum was more effective among minority smokers than placebo bupropion and placebo nicotine gum (Piper et al. 2007). Furthermore, bupropion has been shown to help African-American smokers to stop smoking at higher rates compared to placebo (Ahluwalia et al. 2002; Robles et al. 2008).

Conclusions

Because minority groups have disproportionately greater health problems related to smoking than do whites, some

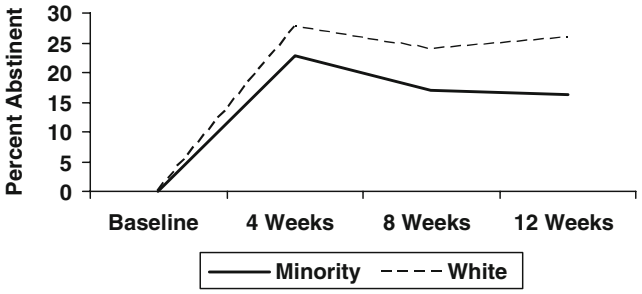

Fig. 1 Smoking abstinence by races for weeks 4, 8, and 12

Table 3 Bivariate logistic regression models for smoking rates at 12 weeks*

Variable	Odds ratio (smoking)	95% confidence intervals for the odds ratio	p-value
Age†	0.976	0.967 to 0.986	<0.0001
Age started smoking†	0.976	0.960 to 0.993	0.0070
Marital status			<0.0001
Not married	1.000		
Married	0.623	0.494 to 0.784	
Fagerström score†	1.197	1.134 to 1.263	<0.0001
Prior quit attempt			0.0011
No	1.000		
Yes	1.853	1.279 to 2.684	
Quit before for at least 1 day			0.0083
No	1.000		
Yes	0.601	0.412 to 0.877	
40 or more cigarettes per day at study entry			0.0396
No	1.000		
Yes	1.498	1.019 to 2.202	
Major depression			0.0408
No	1.000		
Yes	1.357	1.013 to 1.819	
Treatment			<0.0001
Nicotine inhaler	1.000		
Bupropion	0.489	0.361 to 0.661	
Combination treatment	0.323	0.241 to 0.433	
Gender			0.0681
Female	1.000		
Male	0.812	0.649 to 1.016	
Education beyond high school			0.8938
No	1.000		
Yes	0.984	0.771 to 1.255	
BMI†	0.990	0.973 to 1.008	0.2858
Tried prior nicotine			0.8026
No	1.000		
Yes	0.972	0.778 to 1.214	
Number of years smoked			0.4885
Less than 5 Years	1.047	0.600 to 1.827	
At least 5 years but less than 10 years	1.000		
10 years or more	0.825	0.581 to 1.172	
Race			0.0072
White	1.000		
Minority	1.781	1.169 to 2.714	

†Age, age started smoking, BMI, and Fagerstrom score were treated as continuous variables. For these variables the odds ratio presented is for a one-unit increase (i.e., per 1-year increase in age). All other characteristics were treated as categorical variables. For these characteristics an odds ratio of 1.000 is used to indicate the reference group. Odds ratios >1.000 indicate an increased likelihood of smoking at 12 weeks

have hypothesized that greater availability and individualization of health-care options may help reduce some of this disproportion (Dundas et al. 2001; Houston et al. 2005; Shah and Cook 2008). In a study by White et al., it was found that despite the fact that British ethnic minorities (Bangladeshi and Pakistani) had high motivation to quit smoking, the barriers were too many to overcome (White et al. 2006). The many barriers named include: perceived barriers such as peer pressure, stresses, withdrawal, lack of accessibility to health care for smoking cessation and lack

Table 4 Multivariate logistic regression model for smoking rates at 12 weeks*

Variable†	Odds ratio (smoking)	95% Confidence intervals for the odds ratio	p-value
Age	0.971	0.960 to 0.982	<0.0001
Marital status			0.0029
Not married	1.00		
Married	0.678	0.525 to 0.876	
Fagerström score	1.244	1.172 to 1.320	<0.0001
Prior quit attempt			0.0044
No	1.000		
Yes	1.812	1.203 to 2.728	
Treatment†			<0.0001
Nicotine inhaler	1.000		
Bupropion	0.480	0.348 to 0.663	
Combination treatment	0.328	0.240 to 0.450	
Race†			0.0083
White	1.000		
Minority	1.849	1.171 to 2.919	

*In order to assess whether differences between race groups was dependent on treatment, an initial model was fit that included all main effect terms along with the race-by-treatment interaction effect. From this analysis the race-by-treatment interaction was not found to be statistically significant (p=0.8113). Therefore, the findings presented here are from the model that includes only main effect terms

†Age and Fagerstrom score were treated as continuous variables. For these variables the odds ratio presented is for a one-unit increase (i.e., per 1-year increase in age). All other characteristics were treated as categorical variables. For these characteristics an odds ratio of 1.000 is used to indicate the reference group. Odds ratios >1.000 indicate an increased likelihood of smoking at 12 weeks

of pharmaceutical aids; the health-care community believed that language, religion, and culture contributed to reduced smoking cessation health care among this population. Despite the fact that this study by White et al. (2006) took place in Britain and our study was in the USA, the issues with health care among minorities in our respective nations is still the same. It can be hypothesized that the lower rates of smoking abstinence among minority smokers may be explained by reduced health care, possibly due to economics, misconceptions, lack of communication, and/or lack of cultural understanding by health-care providers (Fu et al. 2007; King et al. 1997). The various options of tobacco dependence treatment should be explored with the individual smokers for acceptability as well as to meet individual needs (White et al. 2006). Currently, treatment for a general smoker who is considered a "light" smoker (<15 cigarettes per day) is not the same as that for a "heavy" smoker (>25 cigarettes per day), but as is evident in this study, the number of cigarettes per day should not be the sole deciding factor in determining the type and intensity of treatment a smoker receives. A more targeted approach to the role of behavioral interventions in the treatment of smokers has been evaluated in the past (Fernander et al. 2006), but a targeted approach that considers racial and cultural differences that can lead to acceptability of and compliance with treatment for medical interventions has yet to be examined (Lillard et al. 2007; White et al. 2006). In a current study from a clinical treatment program, it was found that whereas gender differences existed in those enrolling in a formal treatment program, gender did not ultimately affect smoking abstinence at 6 months. It was hypothesized that this could possibly be due to individualization of the treatment program for each patient (Croghan et al. 2008b). An overall targeted approach in the medical management of tobacco dependence (behavioral and medical intervention) may also be the preferred approach in minority smokers.

Limitations

This study was designed to mimic a "real-life" situation as much as possible. Although this reasoning was noteworthy, it limited the investigation results. Limitations to this study include the facts that all study sites were within the USA and that study subjects were all volunteers and may not be representative of minority smokers in the general global population. In addition, no data were collected regarding the frequency and patterns of medication use. Whereas all subjects were instructed on the proper use and dosing of all study medication, no tracking of their actual use was conducted, nor was their acceptability of the medication assigned to them or their comprehension of the instructions documented. In addition, no follow-up or data capture took

place concerning any additional medications or behavioral counseling the subject may have used outside the study.

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Conflict of Interest The authors confirm that there are no relevant associations that might pose a conflict of interest.

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