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Stop-smoking medications: Who uses them, who misuses them, and who is misinformed about them?

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This study assessed smokers' beliefs about nicotine and the safety of nicotine medications and examined how these beliefs influence the use of nicotine medications. The data for this paper came from a nationally representative, random-digit-dialed telephone survey of 1,046 adults (18 years of age and older) current cigarette smokers conducted between May and September 2001. Respondents were questioned about their use of stop smoking medications, beliefs about nicotine, and the safety/efficacy of nicotine medications. Nearly all adult smokers in our survey had heard of nicotine patches (97%) or gum (94%), with lower levels of awareness reported for the nicotine inhaler (41%), and nasal spray (9%). Thirty-eight percent of smokers had previously used nicotine medications, with the nicotine patch being the most commonly used medication. The data reveal that most smokers are misinformed about the health risks of nicotine and the safety/efficacy of nicotine medications. Approximately half incorrectly reported that the reduction in nicotine in cigarettes has made cigarettes less dangerous to health and only one-third correctly reported that nicotine patches were less likely to cause a heart attack than smoking cigarettes. Smokers who were more knowledgeable about the health risks of nicotine and the safety and efficacy of nicotine medications were more likely to report past use of nicotine medications. Misperceptions about the health risks of nicotine and the safety/efficacy of nicotine medications may discourage some smokers from considering the use of these medications to help them stop smoking.

Introduction

Addiction to nicotine is the primary reason smokers continue to smoke (Royal College of Physicians, 2000; U.S. Department of Health and Human Services, 1988). Nicotine withdrawal symptoms following abrupt cessation of tobacco use makes stopping smoking difficult for many smokers (Benowitz, 1988; Etter & Perneger, 2001; Silagy, Mant, Fowler, & Lancaster, 2002; U.S. Department of Health and Human Services, 1988). Fortunately, nicotine replacement medications such as the patch, gum, inhaler, lozenge, and nasal spray have been found to ease withdrawal symptoms during the initial stages of smoking cessation and increase cessation rates in clinical trials (Silagy et al., 2002). In 1996, the U.S. Food and Drug Administration made

nicotine patches and gum available over-the-counter (OTC) in an effort to increase access to these medications. While use of these medications increased considerably due to OTC availability, the vast majority of smokers are not using nicotine medications to help them stop smoking (Centers for Disease Control and Prevention, 2000; Hughes, Shiffman, Callas, & Zhang, 2003; Pierce & Gilpin, 2002; Thorndike, Biener, & Rigotti, 2002).

It is reasonable to ask why this is so. One explanation is that the medications cost too much. Evidence from several studies show that when cost barriers are reduced, utilization increases (Curry, Grothaus, McAfee, & Pabiniak, 1998). However, cost is not the only explanation for the underutilization of nicotine medications by smokers. Etter and Perneger conducted a study of nearly 500 smokers and former smokers to identify attitudes about the use of nicotine medications (Etter & Perneger, 2001). Results from this study revealed that many smokers were worried about using nicotine medications because of safety concerns. Also, some smokers held the belief that they would be trading their addiction to cigarettes for an addiction to a medication containing nicotine. Only

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16% agreed that nicotine medications help people quit smoking. Knowledge about nicotine medications was highest among those who had previously used nicotine medications and those most interested in stopping smoking in the future (Etter & Perneger, 2001).

This paper presents data on smokers' beliefs about the health risks of nicotine and perceptions about the safety and efficacy of nicotine medications, as well as exploring how these beliefs are associated with past use of nicotine medications by smokers.

Method

The data for this paper comes from a nationally representative, random-digit-dialed telephone survey of 1,046 adult (18 years of age and older) current cigarette smokers conducted between May and September 2001. The response rate for the survey was 77% (The American Association for Public Opinion Research, 2000). More detailed information on how the survey was conducted can be found elsewhere (Cummings et al., 2004). The data were weighted to adjust for the probability of selection and the age, race, and gender distribution of U.S. adult smokers, using estimates from the 1998/99 Current Population Survey Tobacco Use Supplement (U.S. Department of Commerce Census Bureau, 2001). All statistics were run using proportions obtained by this weighting procedure, with weighted total number in the sample normalized to the original sample size (1,046).

The mean age of the entire sample of smokers was 41 years, with 15% of respondents 55 years or older. Twenty percent of respondents identified themselves as non-White, and half had completed more than 12 years of formal education. Twenty-five percent of respondents smoked 25 or more cigarettes per day, 42% smoked 15–24 cigarettes per day, and 33% smoked less than 15 cigarettes per day. Of smokers who had ever used any stop-smoking medication, 52% said they had used it in the past year, and 32% of all smokers said they expected to stop smoking in the upcoming year.

The 25-minute telephone interview included questions on a wide range of topics pertinent to defining the subject's smoking history, as well as beliefs about smoking. Relevant to this analysis were questions asked about current and previous use of stop-smoking medications, beliefs about the health risks of nicotine, and the safety and efficacy of using nicotine medications. Respondents were asked about their previous use of the nicotine patch, nicotine gum, nicotine inhaler, nicotine nasal spray, and bupropion.

Questions asked were as follows:

1. Have you ever heard of (product)?
2. Have you heard of any safety concerns associated with (product)? For those who had, we asked:

3. What safety concerns have you heard about? Those who had heard of the product were asked:
4. Have you ever used the (product)?; and if they had:
5. Are you currently using (product)?

For respondents who were current or past users of any of the products we also asked:

1. Did you read any of the product insert that came along with the package?
2. Did you ever smoke cigarettes or use any other tobacco product on the same days that you used the (product)?
3. Did you ever use the (product) with the intention of just cutting down on the amount of cigarettes you smoke every day?

We also asked respondents a series of questions to assess their knowledge of the health risks of nicotine and the safety and efficacy of using nicotine medications. An index of knowledge about the health risks of nicotine was assessed by tallying correct responses to three questions/statements:

1. Respondents were told that cigarette manufacturers had changed their cigarettes in a variety of ways over the previous 50 years and asked if they thought that the reduction of nicotine made the cigarette less dangerous to the smoker (the correct response is "no").

Respondents were also asked if they agreed, disagreed, did not know how to answer, or had no opinion about the following statements:

1. Nicotine is a cause of cancer (the correct response is "disagree"); and
2. The claim that a cigarette brand is low in nicotine means that it is less addictive (the correct response is "disagree").

An index to measure knowledge about the safety and efficacy of using nicotine medications was assessed by tallying correct responses to the following seven questions/statements:

1. Are nicotine patches more likely, about as likely or less likely to cause someone to become addicted as regular cigarettes? (the correct response is "less likely");
2. Is nicotine gum more likely, about as likely or less likely to cause someone to become addicted compared with regular cigarettes? (the correct response is "less likely");
3. Are nicotine patches more likely, about as likely, or less likely to cause someone to have a heart attack as cigarettes (the correct response is "less likely").

Respondents were also asked if they agreed, disagreed, did not know how to answer, or had no opinion about the following statements:

4. Nicotine medications work by completely eliminating the urge to smoke (the correct response is "disagree");

5. Nicotine medications work by making you physically sick if you take them and smoke at the same time (the correct response is "disagree");

6. It is easy to get addicted to nicotine gum (the correct response is "disagree"); and

7. Nicotine medications like the patch and gum improve a smoker's chances of quitting successfully? (the correct response is "agree").

Standardized knowledge scores were computed for each knowledge index by summing the number of "correct" answers to questions and dividing this number by the total number of questions to which the person responded.

Data analysis

A logistic regression model was constructed modeling ever use of nicotine medications (i.e., past or current use of nicotine patch, gum, inhaler, or nasal spray) as a function of knowledge about the health risks of nicotine and knowledge of the safety/efficacy of nicotine medications, adjusted for respondent's age (18–24 years, 25–34 years, 35–44 years, 45–54 years, 55+ years), gender (male or female), race/ethnicity (white, non-Hispanic; non-white), education (less than 12 years, 12 years, 13–15 years, 16+ years), cigarettes smoked per day (<5, 5–14, 15–24, 25–34, 35+), type of cigarette smoked (unfiltered regular, filtered regular, light, or ultralight), current use of a non-cigarette tobacco product (yes, no), and future intention to stop smoking in the next one year (yes, no). Knowledge of the health risks of nicotine index was divided into four categories describing the percentage of correct responses given (0%, 1%–33%, 34%–66%, 67%–100%), with a range of 0 to 3. Knowledge of the safety and efficacy of nicotine medications index was divided into five categories (0%, 1%–25%, 26%–50%, 51%–75%, 76%–100%), with a range of 0 to 7.

In addition, linear regression models were constructed to examine factors associated with knowledge of the health risks of nicotine and knowledge of the safety/efficacy of nicotine medications. Each knowledge index was analyzed separately as a continuous variable for ever and never users of any nicotine medication (nicotine patch, gum, inhaler, or nasal spray). Predictor variables evaluated in these models included demographic factors (i.e., age, race/ethnicity, education), and tobacco use history (i.e., amount smoked per day, type of cigarette smoked, use of other tobacco products, and future intention to stop smoking in the next year).

Results

As shown in Table 1, nearly all U.S. adult smokers had heard of nicotine patches (97%) or gum (94%), with awareness of the nicotine inhaler (41%) and nasal spray (9%) somewhat lower. Overall, 40% of respondents ($n=419$) reported having previously used any nicotine medication or bupropion. Thirty-two percent had used nicotine medications only, 2.2% used bupropion only, and 6% used nicotine medications and bupropion. Seventeen percent of smokers had used any stop smoking medication in the past 12 months. Among ever users of any stop smoking medication, the nicotine patch and nicotine gum were the most frequently used medications (patch: 65.1%, gum: 56.9%). Forty-one percent of respondents had heard of safety concerns associated with at least one of the products. Table 1 also shows the reported safety concerns related to each product. Health problems with concurrent smoking was the most common safety concern associated with the nicotine patch, while risk of addiction and mouth ulcers were the most common concerns related to using the nicotine gum. Seizures, nausea, and dizziness were the most commonly mentioned safety concerns associated with using bupropion.

Table 2 displays responses of smokers to questions about the health risks of nicotine and the safety and efficacy of nicotine medications according to whether they had ever used any nicotine medication. The range of responses for the health risks of nicotine index was from 0 to 3, with a mean for the sample of 50% correct responses in ever users compared to 47% correct responses in never users ($p<.10$). The range of responses for the safety and efficacy of nicotine medications was from 0 to 7, with a mean for the sample of 50% correct responses in ever users compared to 40% correct responses in never users ($p<.01$). Respondents who had previously used nicotine medications tended to be more knowledgeable about the health risks of nicotine and the safety/efficacy of nicotine medications.

Table 3 shows the results of the logistic regression model examining the relationship between smokers' knowledge about the health risks of nicotine, their knowledge of the safety/efficacy of nicotine medications, and their past use of nicotine medications, controlling for demographic and smoking history variables. Increasing scores on the knowledge of the safety and efficacy of nicotine medications indices was associated with a greater likelihood of past use of nicotine medications. Past use of nicotine medications was also more common among older smokers, those who reported smoking an ultra-light cigarette, and those who believed they would stop smoking in the next year. Respondents who were more knowledgeable about stop smoking medications were less likely

Table 1. Patterns of use and concerns about use among U.S. smokers about smoking cessation medications, 2001.

Question	Nicotine patch		Nicotine gum		Nicotine inhaler		Nicotine nasal spray		Bupropion	
	n	%*	n	%*	n	%*	n	%*	n	%*
Respondents who have heard of [product]	1007	97%	971	94%	406	41%	100	9%	645	63%
% who report having heard of any safety concerns associated with [product]	314	32%	91	9%	25	6%	4	3%	147	22%
If yes:										
"What safety concerns have you heard about?"		n/ %		n/ %		n/ %		n/ %		n/ %
	health problems if smoke	87/ 33%	addiction	15/ 23%	sore throat	6/ 30%	nasal bleeding	3/ 76%	seizures	29/ 24%
	heart concerns	65/ 21%	mouth ulcers	15/ 18%	addiction	3/ 16%	other concerns	1/ 24%	nausea or dizziness	20/ 13%
	skin concerns	28/ 10%	cancer	12/ 14%	heart concerns	3/ 14%			heart concerns	7/ 10%
	nausea or dizziness	20/ 9%	heart concerns	6/ 7%	nasal bleeding	3/ 10%			sleep disturbances	10/ 7%
	other concerns	123/ 41%	other concerns	35/ 42%	other concerns	14/ 58%			other concerns	83/ 58%
% who report having ever used [product]	271	25%	233	22%	18	2%	2	0%	89	8%
Among non-users:										
"Why haven't you used [product]?"	no need	356/ 59%	no need	279/ 48%	no need	182/ 63%	no need	45/ 55%	no need	264/ 60%
	cost	85/ 14%	cost	50/ 9%	does not work	23/ 8%	nasal discomfort	6/ 12%	cost	31/ 8%
	does not work	72/ 13%	tastes bad	46/ 9%	cost	21/ 7%	does not work	7/ 10%	not safe	21/ 5%
	not safe	43/ 6%	does not work	49/ 9%	not available	9/ 4%	not safe	5/ 7%	does not work	21/ 5%
	other reasons	72/ 11%	other reasons	154/ 27%	other reasons	54/ 19%	other reasons	13/ 16%	other reasons	97/ 23%
Among users:										
Percent reporting having ever used the [product] with the intention of just cutting down	67	25%	68	29%	2	7%	0	0%	26	29%
Percent reporting having ever smoked cigarettes or use any other tobacco product on the same days they used the [product]	122	45%	115	50%	8	39%	1	67%	64	75%
Percent indicating that they read any of the [product] insert that came along with the package	203	75%	145	58%	8	39%	2	100%	68	81%
Of those who read any of the [product] insert, percent who said they read at least half	184	90%	128	88%	8	100%	2	100%	62	93%
Percent who reported previous or current use for 0–7 days	48	17%	30	15%	5	24%	1	67%	6	8%
Percent who reported previous or current use for more than 365 days	7	2%	13	5%	1	4%	0	0%	8	7%

For all samples, unweighted frequencies are shown; the total sample size is 1,046.
*Percentage estimates are weighted to the national current smoker age, race, and gender distribution in the United States.

Table 2. Summary of correct responses to nicotine and nicotine medications knowledge indices by smokers in the United States, 2001.

Knowledge index	Correct response	Ever used any nicotine medication ($n=395$) Percent correct*	Never used any nicotine medication ($n=651$) Percent correct*	Significance
Health risks of nicotine				
Range: 0–3				
Mean percent correct responses		50%	47%	$p<.10^a$
1. "The claim that a cigarette brand is low in nicotine means that it is less addictive."	Disagree	65%	62%	$p=.26$
2. Respondents were told that cigarette manufacturers had changed their cigarettes in a variety of ways over the previous 50 years and asked if they thought the following change had made the cigarette less dangerous to the smoker: "Reduction of nicotine."	No	50%	44%	$p=.06$
3. "Nicotine is a cause of cancer."	Disagree	35%	32%	$p=.28$
Safety/efficacy of nicotine medications				
Range: 0–7				
Mean percent correct responses		50%	40%	$p<.01^a$
1. "Nicotine medications work by completely eliminating the urge to smoke."	Disagree	70%	54%	$p<.01^b$
2. "Nicotine medications like the patch and gum improve a smoker's chances of quitting successfully."	Agree	68%	54%	$p<.01^b$
3. "Are nicotine patches more likely, about as likely, or less likely to cause someone to become addicted as regular cigarettes?"	Less likely	51%	43%	$p<.01^b$
4. "Is nicotine gum more likely, about as likely, or less likely to cause someone to become addicted compared to regular cigarettes?"	Less likely	51%	43%	$p<.01^b$
5. "It is easy to get addicted to nicotine gum."	Disagree	39%	21%	$p<.01^b$
6. "Are nicotine patches more likely, about as likely, or less likely to cause someone to have a heart attack as cigarettes?"	Less likely	37%	34%	$p=.28$
7. "Nicotine medications work by making you physically sick if you take them and smoke at the same time."	Disagree	37%	27%	$p<.01^b$

*Percentage estimates are weighted to the national current smoker age, race, and gender distribution in the United States.
a: Statistically significant difference in means, independent samples Z-test.
b: Variable is statistically significant, chi-square statistic.

to report having used nicotine medications in the past as a way to cut down on the amount of cigarettes smoked (data not shown).

Table 4 summarizes the results of regression analyses examining predictors of scores on the knowledge of health risks of nicotine index and scores on the knowledge of the safety and efficacy of nicotine medications index. Since past use of nicotine medications was associated with knowledge indices, we chose to run our regression models separately for ever and never users of nicotine medications. Overall safety/efficacy knowledge scores decreased with age among never users of any medication, while age was not associated with knowledge among those who had previously used nicotine medications. Safety/efficacy knowledge scores also increased with years of formal education. Heavier smokers who have used any nicotine medication were more informed on safety/efficacy issues, although not as much as never users. Fifty percent of ultra-light smokers in the sample had

ever used any stop smoking medication, and this group seems to be particularly misinformed about safety/efficacy issues compared to smokers of full-flavored brands.

Discussion

The findings from this study reveal that many smokers are misinformed about the health risk of nicotine and the safety and efficacy of nicotine medications. Nicotine in the dosage levels typically received by the smoker from cigarettes or in government approved stop smoking medications is considered to be fairly safe (Benowitz, 1998). While a recent lab based study has speculated that nicotine may act as a co-factor in cancer etiology (West et al., 2003), the available scientific and substantial clinical evidence does not support the conclusion that exposure to nicotine alone is a cause of cancer (Benowitz, 1998). Despite this fact, over half of the respondents in our survey

Table 3. Results of logistic regression analysis relating smoker demographics and tobacco use characteristics to ever use of nicotine stop smoking medications*.

Characteristic	n [a]	Odds ratio	95% confidence interval lower limit	upper limit
Health risks of nicotine index				
Mean percent correct responses: 50%				
0%	187	1.0	Referent	
1%–33%	353	1.1	0.7	1.7
34%–66%	385	1.4	0.9	2.1
67&–100%	121	1.4	0.8	2.3
Safety/efficacy of nicotine medications index				
Mean percent correct responses: 50%				
0%	69	1.0	Referent	
1%–25%	184	3.2	1.3	7.7
26%–50%	391	4.4	1.9	10.2
51%–75%	295	7.6	3.2	17.9
76%–100%	107	10.1	4.1	25.2
Age (years)				
18–24	182	1.0	Referent	
25–34	213	2.1	1.3	3.4
35–44	261	1.5	1.0	2.4
45–54	210	2.7	1.7	4.3
55 and older	180	2.3	1.3	3.8
Gender				
Male	475	1.0	Referent	
Female	571	0.8	0.6	1.1
Race				
White, non-Hispanic	844	1.0	Referent	
Non-White	202	0.8	0.5	1.1
Highest education level completed (years)				
<12	125	1.0	Referent	
12	436	0.7	0.5	1.1
13–15	313	0.5	0.3	0.9
16 and older	163	0.7	0.4	1.3
Cigarettes smoked per day				
<5	59	1.0	Referent	
5–14	307	1.3	0.6	2.7
15–24	432	2.5	1.2	5.4
25–34	130	3.6	1.6	8.1
35 and older	116	3.5	1.5	7.9
Current cigarette type				
regular, filtered	426	1.0	Referent	
regular, unfiltered	26	0.5	0.2	1.4
light, filtered	431	1.1	0.8	1.5
ultralight, filtered	147	1.5	1.0	2.3
Current use of a non-cigarette tobacco product				
No	893	1.0	Referent	
Yes	153	1.3	0.8	1.9
Believe will stop smoking in the next year				
No	704	1.0	Referent	
Yes	342	1.4	1.1	2.0

*Ever users of any nicotine medication were coded as a 1; never users of any nicotine medication were coded as a 0.
[a] Unweighted frequencies are shown; total sample size is 1,046.

believed nicotine is a cause of cancer. This belief may help explain why most smokers now smoke low tar, low nicotine cigarettes, and may help explain the hesitancy that many smokers expressed about using nicotine medications to help them stop smoking.

Despite the fact that drug companies currently spend millions annually to encourage smokers to use nicotine medications to help them quit, many smokers remain misinformed about how these medications work and are worried about their safety. Knowledge deficits were especially pronounced among smokers who had never used nicotine medications in the past, particularly those who were older, less educated, and

users of light and ultra-light cigarettes. The findings from this study are consistent with those of an earlier study conducted by Etter and Perneger, who found that ever users of nicotine medications had more favorable attitudes towards these medications than never users (Etter & Perneger, 2001).

The practical implication of this finding is that offering reluctant smokers an opportunity to try nicotine medications on a trial basis might be a way to improve knowledge about the safety and efficacy of these medications, and eventually increase use of these products for smoking cessation. However, even among those who had previously used nicotine

Table 4. Results of linear regression analysis relating smoker demographics and tobacco use characteristics to beliefs about nicotine and stop smoking medications.

Characteristic	Health risks of nicotine index**		Safety/efficacy of nicotine medications index**	
	% Ever used any nicotine medication	% Never used any nicotine medication	% Ever used any nicotine medication	% Never used any nicotine medication
Age (years)				
18–24	Referent	Referent	Referent	Referent
25–34	−2.0%	0.3%	1.6%	−5.7%
35–44	−2.7%	0.8%	−0.5%	**−8.9%**
45–54	−2.0%	−3.6%	0.2%	**−12.6%**
55 and older	−6.3%	−1.9%	−1.0%	**−19.8%**
Gender				
Male	Referent	Referent	Referent	Referent
Female	1.8%	2.5%	4.5%	**4.1%**
Race				
White, non-Hispanic	Referent	Referent	Referent	Referent
Non-White	1.7%	−5.2%	−4.8%	**−6.1%**
Highest education level completed (years)				
<12	Referent	Referent	Referent	Referent
12	−2.9%	1.2%	**8.7%**	1.7%
13–15	−1.6%	8.0%	**11.1%**	2.2%
16 and older	2.2%	2.3%	**18.4%**	**8.1%**
Cigarettes smoked per day				
<5	Referent	Referent	Referent	Referent
5–14	−7.9%	−3.9%	**17.3%**	2.3%
15–24	−5.0%	−1.8%	**18.1%**	5.7%
25 and older	−0.7%	4.6%	12.5%	2.7%
Current cigarette type				
Regular, filtered	Referent	Referent	Referent	Referent
Regular, unfiltered	3.2%	−0.6%	8.5%	3.1%
Light, filtered	−2.5%	−1.0%	1.0%	−1.2%
Ultralight, filtered	−0.2%	−3.1%	**−8.8%**	4.7%
Current Use of a Non-Cigarette Tobacco Product				
No	Referent	Referent	Referent	Referent
Yes	1.9%	**14.8%**	−4.0%	−3.5%
Believe will stop smoking in the next year				
No	Referent	Referent	Referent	Referent
Yes	5.7%	**7.2%**	0.7%	2.2%

Note: bold entries are statistically significant at $p \leq .05$ compared to the reference category. Values with a positive sign mean more likely to score higher than the referent group; values with a negative sign mean more likely to score lower than the referent group. Estimates of effect are reported where all control variables are considered and the outcome is equal to percent correct responses within each knowledge index.
**See text for description of indices.

medications, knowledge of the health risks of nicotine and how the nicotine medications work was grossly inadequate. Manufacturers of nicotine medications might want to consider how to alter product package inserts, educational materials and advertising in ways that might help smokers gain a more realistic understanding of risks and benefits of nicotine medications. The use of labeling on cigarette packages and advertising such as *low nicotine*, *light*, *mild*, and *smooth* may also contribute to confusion among smokers about nicotine's health risks. At a minimum this study further highlights the need to more carefully monitor smokers' knowledge about the health risks of nicotine and stop smoking medications, since such knowledge likely plays a part in influencing decisions about product choices and whether or not to continue to smoke.

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