Published in final edited form as:

J Rural Health. 2013 January ; 29(1): 106–112. doi:10.1111/j.1748-0361.2012.00415.x.

Ongoing self-engagement in quit attempts and cessation outcomes among rural smokers who were unable to quit after two years of repeated interventions

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Abstract

Purpose—As many smokers experience repeated failures with cessation attempts, it has been postulated that we may create a cadre of highly resistant smokers who are unlikely to engage in treatment or succeed in quitting. Our purpose was to follow a group of recalcitrant rural smokers and examine their ongoing engagement in smoking cessation activities.

Methods—At the end of a 24-month disease management program for rural smokers, we identified participants who reported ongoing daily smoking despite exposure to 4 previous cycles of smoking cessation interventions. At month 36 (1 year after conclusion of the study) we contacted these participants and assessed changes in smoking status and ongoing engagement in cessation activities over the preceding 6 months. We assessed quit attempts and use of pharmacotherapy during the prior 6 months, as well as smoking abstinence at 36 months.

Findings—Among 333 recalcitrant smokers, 49% reported at least one 24-hour quit attempt during the preceding 6 months, 29% tried smoking cessation pharmacotherapy, and 5% quit smoking. Significant predictors of having at least one 24-hour quit attempt were lower numbers of cigarettes smoked per day, being in preparation stage of change, and more pharmacotherapy-assisted quit attempts during the original 24-month trial. Higher motivation to quit and more previous pharmacotherapy-assisted quit attempts significantly predicted cessation medication use. Use of varenicline was strongly associated with cessation.

Conclusions—Many recalcitrant rural smokers continue to engage in treatment and make quit attempts even in the absence of active interventions.

Keywords

drug abuse; epidemiology; family medicine; health promotion; observational data

Although the United States has seen a large reduction in smoking rates over the past 50 years, the rate of decline appears to have stalled in recent years.¹ This appears to be particularly problematic in rural communities.² It has been hypothesized that as smoking rates have declined, we may have encountered an increasingly “hardcore” group of smokers

for whom cessation may be particularly difficult.³ Indeed, smokers participating in cessation trials have experienced decreasing rates of success over time.⁴ This could have important implications for health care practitioners as they try to engage smokers in repeated quit attempts.

Although cigarette smoking can be conceptualized as a chronic disease with repeated cycles of quitting and relapse,^{5–7} most smoking cessation studies have offered only a single treatment, and little is known about how resistance to quitting might accumulate after repeated interventions. *KanQuit*, the parent study of the current analysis, was the first controlled smoking cessation trial in rural primary care that examined a chronic disease management model for tobacco dependence.⁸ In *KanQuit*, rates of successfully quitting did not diminish during the 4 cycles of treatment spread out over 2 years.⁹ Nevertheless, despite 2 years of intervention, a large portion of the rural smokers in the *KanQuit* study failed to quit. In the present study, we followed this group of recalcitrant smokers and examined their ongoing efforts to quit in the absence of any ongoing interventions. Furthermore, we tried to identify factors that were associated with quit attempts, use of pharmacotherapy, and successful cessation.

METHODS

This is a prospective follow-up study of recalcitrant smokers who continued to smoke 6 months after the completion of *KanQuit*, a 2-year population-based smoking cessation clinical trial. The recruitment methods, study methodology, and primary smoking cessation outcomes of the parent study have been described elsewhere.^{8,10} The study protocol was approved and monitored by the University of Kansas Medical Center's Human Subjects Committee.

During the 24 months of the *KanQuit* trial, participants were randomized to 1 of 3 study intervention arms: pharmacotherapy management alone (PM), pharmacotherapy management with up to 2 counseling calls every 6 months (low level of disease management; LDM), or pharmacotherapy management with up to 6 counseling calls every 6 months (high level of disease management; HDM). Pharmacotherapy (Nicotine Replacement Therapy (NRT) or bupropion) was provided for free to all 3 treatment groups. The content of the counseling calls was based on motivational interviewing (MI) techniques^{11,12} that emphasized increasing intrinsic motivation and supporting self-efficacy to quit if the smoker was not ready to set a quit date. For those who were ready to set a quit date, the counseling calls focused on maintaining this behavioral goal and building an individualized action plan using cognitive-behavioral therapy (CBT) techniques.

Participants

Seven hundred and fifty smokers were recruited from 49 primary care practices in the state of Kansas for *KanQuit*. All practices were participating sites in the Kansas University School of Medicine rural primary care clerkship. Based on the 2003 United States Department of Agriculture rural-urban continuum codes,¹³ 10 practices were located in smaller communities within urban counties, and the remaining 39 practices located in non-metropolitan counties. Participants were at least 18 years old, smoked at least 10 cigarettes a day for at least 25 of the past 30 days, spoke English, had a working telephone, and considered one of our participating physicians to be their regular primary care doctor. The participants did not need to be interested in stopping smoking. Smokers were enrolled and randomized to 1 of the 3 intervention arms, which included varying levels of counseling with offers of free pharmacotherapy (nicotine patch or bupropion) every 6 months.

Participants in this current study were 333 recalcitrant smokers who were still smoking 6 months after completion of all of the interventions in the KanQuit study (month 30) and completed a follow-up survey at 36 months (Figure 1). Since the primary outcomes of the KanQuit study did not identify any differences in quit rates between treatment arms at 24 months, we included recalcitrant smokers from all 3 treatment groups described above in the current analyses.

Measures

Outcomes were derived from the 36-month survey and included:

Quit attempts—Quit attempts were defined as a 24-hour quit attempt. Because the distribution of the number of 24-hour quit attempts was highly skewed in the sample, we dichotomized it into “at least one 24-hour quit attempt” versus “no quit attempt.”

Use of cessation medications (months 30–36)—In the 36-month survey, we assessed participants’ use of NRT, bupropion, or varenicline within in the past 6 months. Varenicline, a newer cessation medication, was not provided in the original 24-month trial, and it entered the pharmacotherapy market soon after the 24-month assessments began. Based on its efficacy in randomized clinical trials,^{14,15} we hypothesized that varenicline would be associated with higher quit rates than NRT or bupropion.

Smoking abstinence—Abstinence was based on self-reported 7-day point prevalence abstinence at 36 months.

We tested for potential predictors of these outcomes, including: treatment arm during the original 24-month trial, gender, metropolitan status of the county, the motivation and confidence to quit at 24 months, stage of readiness to quit at 24 months, number of cigarettes smoked per day at 24 months, and the number of pharmacotherapy-assisted quit attempts during the 24-month trial. Some of these predictors, namely gender, stage of change, and number of cigarettes smoked per day, have been shown previously to predict long-term abstinence.¹⁶

Motivation and confidence to quit at 24 months—Global motivation and confidence to quit were assessed using single 10-point Likert scale items at 24 months. Higher scores indicate greater motivation or confidence to quit smoking.

Smoking characteristics at 24 months—Number of cigarettes smoked per day at 24 months was asked as part of the smoking behaviors questions at 24-month assessment. Two items were used to assess stage of readiness to stop smoking at 24 months.^{17,18}

Number of pharmacotherapy-assisted quit attempts during the 24-month treatment period—The total number of free pharmacotherapy requests between 0–24 months was counted for each smoker. Because they could only request cessation medication once in each 6-month treatment cycle, this variable ranges from 0–4.

Statistical Analyses

Chi-square tests were used to examine bivariate relationships between categorical predictors and all 3 of the outcomes, and 2-sample *t* tests were conducted to identify significant bivariate relationships between continuous predictors and the 3 outcome variables. Significant bivariate predictors were then entered into a multivariate logistic regression model to test for each predictor’s independent contribution to the outcome. Treatment arm was controlled for in the final logistic model of each outcome.

RESULTS

At 36 months, among the 333 recalcitrant smokers, 161 (48.6%) had engaged in at least one 24-hour quit attempt in the preceding 6 months, and 95 (28.5%) had tried using smoking cessation pharmacotherapy (Table 1). Also, 15 (4.5%) of them reported 7-day point prevalence abstinence at 36 months. The average duration of smoking abstinence was 84.4 days, with a range of 9 to 152 days out of 180 days.

Table 1 displays the results of the bivariate analyses. Higher motivation to quit at 24 months and higher number of pharmacotherapy-assisted quit attempts during the trial were significantly associated with use of pharmacotherapy between months 30–36 ($P < .01$ and $.05$, respectively). When they were entered into the multivariate logistic regression model, these 2 predictors were still statistically significant in predicting this medication use outcome ($P = .05$ and $.05$, respectively) (Table 2).

Significant bivariate predictors of making at least one 24-hour quit attempt between 30–36 months were: being in preparation stage of change at 24 months (OR = 4.04, $P < .0001$), use of NRT (OR = 3.97, $P < .0001$), use of varenicline (OR = 3.53, $P < .0005$), lower number of cigarettes smoked per day at 24 months ($t = 5.31$, $P < .0001$), higher motivation to quit at 24 months ($t = -2.16$, $P < .05$), and higher number of previous pharmacotherapy-assisted quit attempts ($t = -3.38$, $P < .001$) (Table 1). Multivariate logistic modeling showed that all of these remained as significant predictors, except motivation to quit at 24 months (Table 2). Of note, 56.5% of the smokers who had at least one 24-hour quit attempt in 30–36 months did not use any pharmacotherapy.

Bivariate analyses showed that varenicline use was the only significant predictor of 7-day point prevalence quit status at 36 months (OR = 7.129, $P < .0001$) (Table 1). In the multivariate logistic regression model, varenicline use remained a significant predictor of this cessation outcome (OR = 7.794, $P < .0005$).

DISCUSSION

This study followed a group of smokers who were still smoking after 2 years of repeated cessation treatment for a year and observed their ongoing engagement in smoking cessation efforts between 6 and 12 months after all interventions ended. Despite their history of prior failures, half of these recalcitrant rural smokers continued to try to quit, 1 in 4 tried using pharmacotherapy, and 4.5% successfully quit.

In Kansas, 24.5% of smokers report use of cessation medication in the past year,¹⁹ and in the US as a whole, 16% of smokers who tried to quit in the past year used cessation medication.²⁰ Additionally, among US adults, 40% of smokers report a 24-hour quit attempt in the past year,^{21,22} with an annual quit rate of approximately 2%–3%.^{23,24} The recalcitrant smokers followed in our study made comparable efforts to quit smoking. This ongoing engagement in cessation efforts is encouraging and, as shown in this study, may eventually lead to successful quitting.

At the time of this study, varenicline had just recently entered the market and 14% of our participants tried this “new” cessation medication. Similar numbers of smokers continued to try NRT and 5% tried bupropion. Although most smokers using bupropion or NRT were not successful, a previous study⁹ showed that repeated use of NRT or bupropion was associated with ongoing cessation success; our failure to see comparable results in this study could be related to the small number of participants using these treatments. Nevertheless, we did see a strong relationship between successful cessation and the use of varenicline. This could be due to the reputed greater efficacy of varenicline^{14,15} or perhaps greater impact from using a

more novel treatment approach. Regardless of the explanation, our data suggest that we should try to get more recalcitrant smokers to try new cessation treatments such as varenicline or perhaps combination NRT treatment.⁵

Our findings that being in the preparation stage of readiness to quit smoking and smoking fewer cigarettes per day significantly predict at least one 24-hour quit attempt confirmed the importance of cognitive and behavioral preparation for the final goal of quitting. The lower number of cigarettes smoked per day may have increased the smokers' self-efficacy to quit, and hence they would have been more likely to make a quit attempt. Additionally, our study demonstrates the lasting effects of motivation to quit, with higher motivation at 24 months being significantly related to use of cessation medications between 30–36 months. Psychosocial interventions that facilitate motivation to quit, moving smokers to the preparation stage of readiness to quit, or reducing number of cigarettes smoked per day may provide important intermediate steps to help recalcitrant smokers quit. Recalcitrant smokers that made previous pharmacotherapy-assisted quit attempts, even though they failed, were also more likely to make quit attempts and try pharmacotherapy again. Together, these findings support the underlying principles of the chronic disease model approach to treatment of tobacco dependence. Recalcitrant smokers appear receptive to ongoing pharmacotherapy and might benefit from psychosocial interventions in which they might learn more about proper usage of cessation medications or develop cognitive-behavioral skills to cope with triggers of their cigarette smoking.^{25,26}

One of the strengths of this study was the success in following a large cohort of smokers over 36 months. Limitations, however, include the reliance on self-report to assess use of medications and smoking-related outcomes. We also did not have data on sustained abstinence. Despite these limitations, our study suggests that many recalcitrant smokers continue to engage in cessation efforts and experience successful quit attempts. Among these recalcitrant smokers, use of effective pharmacotherapy and previous pharmacotherapy-assisted quit attempts are significant predictors of these positive outcomes.

Acknowledgments

The authors thank the volunteers who participated in this research and the primary care doctors in the Kansas Physicians Engaged in Prevention Research (KPEPR) network who opened their practices to this study.

Funding: This research was supported by grant number CA 1102390 from the National Cancer Institute at the National Institutes of Health.

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*Non-smokers are defined as those who reported quit for the last 24 hours or 7 days at 24-month assessment.

Figure 1.
Study flow diagram, KanQuit I 36-month follow-up study

Table 1

Descriptive statistics and bivariate relations between predictors and self-engagement and cessation outcomes at 36 months among recalcitrant smokers (N = 333)

		Use of any cessation medication in 30–36 months (n = 95, 28.5%)		At least one 24-hour quit attempt in 30–36 months (n = 161, 48.6%)		7-day point prevalence quit status at 36 months (n = 15, 4.5%)	
Categorical predictors	N	% Yes	OR (95% CI)	% Yes	OR (95% CI)	% Quit	OR (95% CI)
Treatment condition							
PM (Referent)	131	27.48	---	52.67	---	5.34	---
LDM	109	30.28	1.15 (0.65, 2.01)	41.67	0.64 (0.38, 1.07)	3.67	0.68 (0.79, 2.37)
HDM	93	27.96	1.02 (0.57, 1.85)	51.09	0.94 (0.55, 1.60)	4.30	0.80 (0.23, 2.80)
Gender							
Female (Referent)	207	33.18	---	48.54	---	4.83	---
Male	126	23.02	0.64 (0.385, 1.061)	48.80	1.01 (0.65, 1.58)	3.97	0.81 (0.27, 2.44)
Stage of change							
Pre-contemplation (Referent)	77	23.38	---	36.36	---	3.90	---
Contemplation	156	26.92	1.21 (0.64, 2.28)	41.56	1.24 (0.71, 2.19)	3.21	0.82 (0.19, 3.51)
Preparation	96	35.42	1.80 (0.92, 3.53)	69.79	4.04 (2.14, 7.64)	7.29	1.94 (0.49, 7.77)
NRT use in 30–36 months							
No (Referent)	289	---	---	44.64	---	4.50	---
Yes	42	---	---	76.19	3.97 (1.88, 8.38)	2.38	0.52 (0.07, 4.06)
Bupropion use in 30–36 months							
No (Referent)	315	---	---	47.62	---	4.44	---
Yes	16	---	---	68.75	2.42 (0.82, 7.12)	0.00	---
Varenicline use in 30–36 months							
No (Referent)	285	---	---	44.56	---	2.46	---
Yes	46	---	---	73.91	3.53 (1.75, 7.09)	15.22	7.13 (2.37, 21.41)

	Use of any cessation medication in 30–36 months (n = 95, 28.5%)		At least one 24-hour quit attempt in 30–36 months (n = 161, 48.6%)		7-day point prevalence quit status at 36 months (n = 15, 4.5%)	
Categorical predictors	N	% Yes	OR (95% CI)	% Yes	OR (95% CI)	% Quit
Metropolitan status						
Metro (Referent)	82	32.93	---	48.15	---	6.10
Non-metro	251	27.09	0.757 (0.442, 1.296)	48.80	1.026 (0.622, 1.695)	3.98
						0.63 (0.212, 1.927)

	Use of any cessation medication in 30–36 months				At least one 24-hour quit attempt in 30–36 months				7-day point prevalence quit status at 36 months			
Continuous predictors	Yes mean (SD)	No mean (SD)	P	Yes Mean (SD)	No mean (SD)	P	Quit mean (SD)	Not quit mean (SD)	P	Quit mean (SD)	Not quit mean (SD)	P
Cigarettes smoked per day at 24 months	15.04 (9.53)	15.18 (9.33)	.91	12.48 (7.28)	17.72 (10.42)	< .0001	12.33 (5.68)	15.27 (9.50)	.08	12.33 (5.68)	15.27 (9.50)	.08
Motivation to quit at 24 months ^a	8.80 (1.71)	8.19 (2.35)	.01	8.63 (1.97)	8.11 (2.38)	.03	7.00 (2.88)	8.43 (2.15)	.08	7.00 (2.88)	8.43 (2.15)	.08
Confidence to quit at 24 months ⁺	6.10 (2.78)	5.60 (2.82)	.15	5.92 (2.74)	5.53 (2.88)	.20	5.73 (3.39)	5.74 (2.79)	.99	5.73 (3.39)	5.74 (2.79)	.99
Number of pharmacotherapy-assisted quit attempts between 0–24 months	1.89 (1.28)	1.51 (1.22)	.01	1.86 (1.28)	1.41 (1.17)	< .001	1.27 (1.10)	1.64 (1.25)	.22	1.27 (1.10)	1.64 (1.25)	.22

Note: PM = Pharmacotherapy management alone; LDM = Low level of disease management; HDM = High level of disease management.

^aMotivation and confidence to quit scores range from 0 to 10.

Table 2
Full logistic models of baseline variables predicting self-engagement and cessation outcomes.

Predictor variable	Use of cessation medication 30–36 months		At least one 24-hr quit attempt 30–36 months		7-day point prevalence quit status at 36 months	
	Odds Ratio (95% CI)	P	Odds Ratio (95% CI)	P	Odds Ratio (95% CI)	P
Treatment Arm						
Control (Referent)	—	—	—	—	—	—
LDM	1.19 (0.67, 2.11)	.56	0.47 (0.25, 0.87)	.02	0.56 (0.15, 2.04)	.38
HDM	1.03 (0.56, 1.88)	.93	0.68 (0.37, 1.25)	.21	0.48 (0.11, 1.98)	.31
Stage of Change						
Pre-contemplation (Referent)	—	—	—	—	—	—
Contemplation	—	—	1.02 (0.52, 2.02)	0.95	—	—
Preparation	—	—	2.39 (1.08, 5.29)	0.03	—	—
NRT use in 30–36 months						
No (Referent)	—	—	—	—	—	—
Yes	—	—	4.86 (2.10, 11.26)	< 0.0005	—	—
Varenicline use in 30–36 months						
No (Referent)	—	—	—	—	—	—
Yes	—	—	4.19 (1.94, 9.09)	< 0.0005	7.79 (2.55, 23.87)	< .0005
Number of Cigarettes per day at 24 months						
—	—	—	0.93 (0.90, 0.96)	< 0.0001	—	—
Motivation to quit at 24 months	1.13 (1.00, 1.29)	.05	0.99 (0.87, 1.12)	0.86	—	—
Confidence to quit at 24 months	—	—	—	—	—	—
Number of pharmacotherapy-assisted quit attempts 0–24 months						
—	1.22 (1.00, 1.48)	.05	1.28 (1.03, 1.58)	0.02	—	—