Original Investigation

Utilization of Services in a Randomized Trial Testing Phone- and Web-Based Interventions for Smoking Cessation

Susan M. Zbikowski, Ph.D.,[1] Lisa M. Jack, M.A.,[2] Jennifer B. McClure, Ph.D.,[3] Mona Deprey, M.S.,[1] Harold S. Javitz, Ph.D.,[2] Timothy A. McAfee, M.D., M.P.H.,[4] Sheryl L. Catz, Ph.D.,[3] Julie Richards, M.P.H.,[3] Terry Bush, Ph.D.,[1] & Gary E. Swan, Ph.D.[2]

[1] Free & Clear, Inc., Clinical and Behavioral Sciences, Seattle, WA

[2] Center for Health Sciences, SRI International, Menlo Park, CA

[3] Group Health Research Institute, Seattle, WA

[4] Centers for Disease Control, Atlanta, GA

Corresponding Author: Susan M. Zbikowski, Ph.D., 999 3rd Ave. Suite 2100, Seattle, WA 98104, USA. Telephone: 206-876-2211; Fax: 206-876-2101; E-mail: susan.zbikowski@freeclear.com

Abstract

Introduction: Phone counseling has become standard for behavioral smoking cessation treatment. Newer options include Web and integrated phone–Web treatment. No prior research, to our knowledge, has systematically compared the effectiveness of these three treatment modalities in a randomized trial. Understanding how utilization varies by mode, the impact of utilization on outcomes, and predictors of utilization across each mode could lead to improved treatments.

Methods: One thousand two hundred and two participants were randomized to phone, Web, or combined phone–Web cessation treatment. Services varied by modality and were tracked using automated systems. All participants received 12 weeks of varenicline, printed guides, an orientation call, and access to a phone supportline. Self-report data were collected at baseline and 6-month follow-up.

Results: Overall, participants utilized phone services more often than the Web-based services. Among treatment groups with Web access, a significant proportion logged in only once (37% phone–Web, 41% Web), and those in the phone–Web group logged in less often than those in the Web group (mean = 2.4 vs. 3.7, $p = .0001$). Use of the phone also was correlated with increased use of the Web. In multivariate analyses, greater use of the phone- or Web-based services was associated with higher cessation rates. Finally, older age and the belief that certain treatments could improve success were consistent predictors of greater utilization across groups. Other predictors varied by treatment group.

Conclusions: Opportunities for enhancing treatment utilization exist, particularly for Web-based programs. Increasing utilization more broadly could result in better overall treatment effectiveness for all intervention modalities.

Introduction

There is a large body of literature that demonstrates the effectiveness of phone-based counseling for tobacco cessation (Fiore et al., 2008; Lichtenstein, Glasgow, Lando, Ossip-Klein, & Boles, 1996; Stead, Perera, & Lancaster, 2006) and a growing body of literature demonstrating the effectiveness of Web-based programs (Myung, McDonnell, Kazinets, Seo, & Moskowitz, 2009). It is also well established that treatment utilization is positively associated with cessation, whether delivered by phone (Curry, Grothaus, McAfee, & Pabiniak, 1998; Fiore et al., 2008; Hollis et al., 2007; Stead et al., 2006; Zhu et al., 1996) or Internet (An et al., 2008; Cobb, Graham, Bock, Papandonatos, & Abrams, 2005; Danaher, Smolkowski, Seeley, & Severson, 2008; Graham, Cobb, Raymond, Sill, & Young, 2007; Lenert, Munoz, Perez, & Bansond, 2004; Pike, Rabius, McAlister, & Geiger, 2007; Strecher et al., 2008). However, the use of Web-based programs is not always associated with treatment outcome (McKay, Danaher, Seeley, Lichtenstein, & Gau, 2008; Strecher, Shiffman, & West, 2005).

Many service providers and funders now offer different treatment modalities for cessation. Most typically offer both phone and Web-only programs, and a few offer combined phone–Web counseling. However, no prior studies have systematically compared the effectiveness of these three treatment modalities in a randomized trial. It is important to understand what factors influence treatment utilization as it may indicate ways to increase utilization and treatment success. To date, only a few published studies have examined predictors of utilization within individual modalities (Etter, 2005; Japuntich et al., 2006; Rabius, Pike, Wiatrek, & McAlister, 2008; Severson, Gordon, Danaher, & Akers, 2008; Shiffman, Kassel, Gwaltney, & McChargue, 2005; Strecher, Shiffman, & West, 2006; Strecher et al., 2008 ; Zbikowski, Hapgood, Smucker Barnwell, & McAfee,

2008), and none have compared utilization of treatment delivered with these three different modalities (i.e., phone, Web, or combined).

The current paper reports on treatment utilization patterns and predictors of utilization among participants in the Comprehensive Medication Program And Support Services (COMPASS) smoking cessation trial (Swan et al., 2010). All participants were randomized to one of three behavioral treatment programs: A phone-based counseling program, a Web-based treatment program, or an integrated phone–Web program. Each also received a standard course of varenicline. Based on prior literature, we hypothesized that within each treatment arm, greater utilization of each behavioral intervention would be associated with increased cessation. Compared with participants in the phone or phone–Web group, we expected participants in the Web-only group to have lower utilization rates because participants receiving phone counseling received regular proactive reminders from a coach to use phone and Web services, while Web group participants only received E-mail reminders. While we expected utilization to be influenced by many of the standard variables associated with treatment use in prior studies, we did not have any a priori hypotheses about differential predictors across the treatment arms. Findings from this trial can inform the design of and potentially enhance the effectiveness of future behavioral treatment programs.

Methods

Detailed study methods and results are presented elsewhere (Halperin et al., 2008; McClure et al., 2009; Swan et al., 2010). Briefly, the COMPASS study was a randomized trial comparing the effectiveness of three forms of behavioral intervention for smoking cessation (delivered by Web, phone, or an integrated phone–Web program) in conjunction with varenicline. The content of the behavioral interventions were based on Free & Clear's Quit For Life Phone Program, which has been commercially available for nearly twenty years and its effectiveness demonstrated in a range of studies (Curry et al., 1998; El-Bastawissi et al., 2003; Hollis et al., 2007; McAfee et al., 2008; Orleans et al., 1991; Ringen, Anderson, McAfee, Zbikowski, & Fales, 2002; Swan et al., 2003).

After participants were randomized to treatment, they received a 12-week supply of varenicline (aka Chantix), participated in a 5- to 10-min phone-based orientation to ensure they understood how to utilize their assigned treatment, were mailed a Quit Guide, and were provided a toll-free number to use for ad-hoc support. The orientation was combined with the first call for phone or phone–Web group participants. We conducted the orientation call before the start of the intervention for Web group participants. Other services received varied based on intervention condition. All protocols were approved by the Institutional Review Boards of Group Health (GH), SRI International (SRI), and Free & Clear as well as by a Data and Safety Monitoring Board.

Participants

Participants were recruited from GH through magazine advertisements, employee mailings, physician referrals, and through Free & Clear's Quit For Life Program between October 18, 2006 and October 2, 2007. GH is a nonprofit integrated health care system that serves nearly 600,000 Washington and Idaho residents.

Intervention Details

The phone group received up to five one-on-one phone counseling sessions initiated by a tobacco treatment specialist (aka Quit Coach). Counseling calls consisted of an assessment and planning call, a target quit date (TQD) call, a follow-up call 7 days after the TQD, and two additional post-TQD calls approximately 21 days after the previous calls. During the first call, a detailed history of tobacco use and quitting was collected and used by the Quit Coach to develop a personalized quit plan with the participant. Participants in the Web group had access to the Web site that contained interactive tools and targeted content based on the participant's progress with the quit process. Key features include an interactive quit plan with exercises, educational content in the online library, a quit calendar, progress tracker and tool to E-mail friends/family, and active discussion forums to interact with other members and coaches. The phone–Web group received up to five one-on-one phone counseling sessions and had access to the interactive Web site. For this group only, Quit Coaches had real-time access to data collected by and activities completed on the Web site and could reference this information during counseling calls. Coaches also encouraged use of the Web site during each call.

Participants were required to set a quit date (via the Web site for the Web group, via Web or phone for the phone–Web group, and via phone for the phone group) in order to receive their varenicline prescription. Most participants scheduled their TQD to occur within 30 days from the baseline assessment. Treatment timing was tied to the TQD. Most participants completed treatment within two months after enrolling in the study.

Measures

Participants were surveyed at baseline and 6 months after their TQD. The baseline survey included gender; age; marital status; education; tobacco use measures (Fagerström Test for Nicotine Dependence [FTND]; Heatherton, Kozlowski, Frecker, & Fagerström, 1991); presence of a smoker at home; social support from friends, family, and coworkers; quit attempts of six+ months in the past or for at least 24 hr in the last year; use of cessation medications and other aids during previous quit attempts, and motivation and confidence in quitting. Additional data included a perceived stress scale (Cohen, Kamarck, & Mermelstein, 1983); current and lifetime depressive symptom scales using a brief measure derived from the Hopkins Symptom Checklist (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974); and attitudes about pharmacotherapy, telephone support, Web-based support, and group counseling. Also measured were self-reported access to the Internet, Internet use per week, and comfort conducting business on the Internet (based on a 4-point scale from "*not at all*" to "*quite*").

Follow-up assessment included self-reported 7-day point prevalence abstinence. Follow-up surveys were conducted by phone by survey staff at SRI and Group Health Research Institute.

Utilization of Treatment Interventions

Behavioral treatment utilization was tracked using automated service delivery records at Free & Clear. The Web application recorded each login and the time participants spent using Web

site features. Duration of Web site use was estimate from visits and pages viewed. Outcomes included total calls with a Coach (scheduled plus ad hoc), call duration (total minutes across all calls—scheduled and ad hoc), number of Web logins, and Web duration (total login minutes). The orientation call was included in calculations of calls completed and call duration. We also examined the utilization of Web site features. Medication use (duration of varenicline use) was derived from 6-month follow-up survey self-reported data.

Statistical Analysis

Behavioral Treatment Utilization

Because utilization data were positively skewed, participants with scores greater than the 95th and 99th percentile were capped at the maximum score in the truncated range (total calls were capped at 9, total call minutes were capped at 150, total Web logins were capped at 20, and total Web minutes were capped at 250 min). The mean, *SD*, and range were computed for each variable after truncation. Although the orientation call was not considered counseling, it was included in analyses because it was believed that this call provided important information that was instrumental to assuring use of treatments. Calls were classified into 0, 1, 2, 3, 4, or 5+ calls, and logins were classified into 0, 1, 2, 3–4, or 5+ logins. Zero calls and logins were retained as unique categories to distinguish no use from any use. Use greater than five was combined into one category since few participants used services more than five times. Additionally, three and four Web logins were combined since less than 10% of participants fell into either category. Descriptive statistics (means and frequencies) were computed. Chi-square analyses and analyses of variance were conducted to examine utilization levels within treatment group (Web, phone, and phone–Web).

Utilization as a Predictor of Cessation Outcomes

The primary outcome measurement was self-reported point-prevalent abstinence at 6 months (no smoking, not even a puff, and within the 7 days prior to follow-up contact). An intention-to-treat (ITT) approach was utilized in which individuals who were lost to follow-up were considered to be smoking. The survey follow-up rate was 74.2%. Separate stepwise logistic regression analyses were conducted for each treatment group. In each case, a base model was created that forced in the applicable/corresponding utilization variables and then allowed any baseline variable that was moderately associated with outcomes to enter the model in a stepwise fashion. Baseline variables significant at $p < .05$ were added to the base model, and those left in the model needed to be significant at $p < .15$.

Correlates of Behavioral Treatment Utilization

Analyses were conducted examining the correlation between each of the baseline and utilization (number of calls, call duration, Web logins, and Web duration) variables within each treatment group. Those variables that were significantly correlated at $p < .25$ were further evaluated in stepwise linear regression analyses predicting behavioral treatment utilization measures (number of calls, call duration, Web logins, and Web duration) within each treatment group. Only variables significant at $p < .05$ were added to the existing model, and all variables left in the final model needed to be significant at $p < .15$.

Results

Participant Characteristics

A total of 1,202 participants were randomized. Three participants dropped out before receiving any treatment and therefore had no utilization data. A fourth participant was randomized to the phone condition but mistakenly enrolled in the phone–Web program. These individuals were dropped from the analytic sample, leaving a final sample of 1,198 participants: 399 Web, 400 phone, 399 phone–Web. The sample was 67% female, 90% White, 64% married, averaged 47 years of age, completed an average of 14 years of formal schooling, and was moderately dependent on nicotine (FTND score = 5.0, 20 average cigarettes /day). Sixty-nine percent of the sample was extremely motivated to quit, but only 36% was extremely confident in succeeding, and 48% had reported a quit attempt in the past year. Approximately 54% were recruited from advertisements, mailings, or physician referrals, while 46% were enrolled after being told about the study when they called the Quit For Life Program. Over a third (33% ITT) was quit at the 6-month follow-up. There were no differences in baseline measures or outcomes between the three treatment groups (Swan et al., 2010).

Treatment Utilization

Participants in the phone and phone–Web groups completed approximately four calls (mean 4.1 and 4.2, respectively), while participants in the Web group completed 1.5 calls (including the orientation call) on average. Total call duration averaged 51.1 min ($SD = 37.3$, range: 0–150) across the intervention groups and significantly differed by group. Average total call durations (in minutes) were 14.4 Web, 67.3 phone, and 71.7 phone–Web; $F(2, 1195) = 569.2$, $p < .0001$. Number of calls and call durations included all types of calls (orientation, proactive counseling, and ad-hoc support). Web use averaged 3.1 logins ($SD = 4.2$, range: 0–20) and 41.2 min in total duration ($SD = 56.8$, range: 0–250) across intervention groups and significantly differed by group: logins: 3.7 Web, 2.4 phone–Web; $F(1, 796) = 19.6$, $p < .0001$ and duration: 53.9 Web, 28.5 phone–Web; $F(1, 796) = 42.0$, $p < .0001$.

Utilization levels by behavioral treatment group are further described in Table 1. Most notably, less than 2% of participants within each group completed no calls, and approximately half of the phone (51%) and phone–Web (49%) participants completed five or more calls. In addition, a third of participants in the Web group called for additional support beyond the orientation call. With respect to Web use, 4% of the Web group never logged in, while 22% of the phone–Web group never logged in. A substantial proportion of each group also logged in only one time (41% of Web and 37% of phone–Web). Overall; however, contrary to our hypothesis, Web use was higher in the in the Web group than in the phone–Web group. Specifically, 39% of Web group participants logged in 3+ times compared with only 27% of phone–Web group participants. Among participants randomized to the phone–Web group, we observed an association between phone and Web use, $\chi(20) = 65.9$, $p < .0001$. That is, participants who took more calls logged into the Web site more times and vice versa. Congruently, the highest Web use was seen among participants who complete five or more calls (58% had logged in two or more times compared with less than 25% of those who took fewer than five calls).

Table 1. Total Number of Calls and Number of Web Logins by Behavioral Treatment Group

	Web		Phone		Phone–Web		
	N	% (cumulative %)	N	% (cumulative %)	N	% (cumulative %)	Comparison
Number of calls[a]							
0	5	1.2 (1.2)	8	2.0 (2.0)	3	0.8 (0.8)	$\chi^2(10) = 596.8, p < .0001$
1	263	65.9 (67.2)	33	8.2 (10.2)	31	7.8 (8.5)	
2	75	18.8 (86.0)	25	6.2 (16.5)	32	8.0 (16.5)	
3	35	8.8 (94.7)	58	14.5 (31.0)	60	15.0 (31.6)	
4	10	2.5 (97.2)	72	18.0 (49.0)	79	19.8 (51.4)	
5+	11	2.8 (100.0)	204	51.0 (100.0)	194	48.6 (100.0)	
Number of logins							
0	18	4.5 (4.5)	–	–	88	22.1 (22.1)	$\chi^2(4) = 58.4, p < .0001$
1	163	40.8 (45.4)	–	–	147	36.8 (58.9)	
2	64	16.0 (61.4)	–	–	55	13.8 (72.7)	
3–4	61	15.3 (76.7)	–	–	55	13.8 (86.5)	
5+	93	23.3 (100.0)	–	–	54	13.5 (100.0)	

[a]*Note.* The number of calls included all types of calls (orientation, proactive counseling, and ad-hoc support). The orientation call was delivered before the start of the intervention for the Web group: 96% of participants completed the orientation call. The orientation call was combined with the first counseling call for participants in the phone and phone–Web groups: 88% and 89%, respectively, completed this first call.

Table 2 summarizes which Web features participants used. Overall use of the features was low, consistent with the login and Web duration data. The "Chantix information" page was used most followed by the interactive quit plan exercises. The "healthy habits" was most used, while the "learn from past quits" was least used. The Web group was significantly more likely to use the quit plan features than the phone–Web group. Twenty percent used the E-mail tool to request social support from friends and families, and nearly 40% visited the discussion forums.

Table 2. Utilization of Web-Based Features by Group

	Proportion visiting that page (%)			
	Overall	Web	Phone–Web	p value
Interactive quit plan exercises				
Healthy habits	41.2	61.6	21.0	.0001
Triggers and coping	34.6	49.9	19.4	.0001
Practice quitting	31.2	45.3	17.2	.0001
Substitutes and distractions	29.7	45.8	13.6	.0001
Weight management	29.5	44.0	15.2	.0001
Stress management	29.4	44.3	14.6	.0001
Learn from past quits	11.4	12.2	10.6	.4775
Quit calendar				
Quit date calendar (1st visit)	87.6	97.0	78.3	.0001
Quit date calendar (additional visits)	5.2	7.6	2.8	.0021
Interactive staying quit exercises				
Health benefits of quitting	23.8	26.0	21.7	.1625
Plan for risky situations	20.5	21.6	19.4	.4476
Why I'm glad I quit	19.0	21.6	16.4	.0620
Slipping	18.9	20.9	16.9	.1568
Reward strategies	18.8	20.4	17.2	.2519
Progress trackers and communication tools				
Discussion forums (visits or postings)	38.0	40.7	35.4	.1210
Friends and allies E-mail tool	20.7	32.1	9.3	.0001
Participant profile—review or update	12.6	15.3	9.8	.0216
Quit certificate—download certificate	17.7	20.4	15.2	.0557
Writing testimonials	2.2	3.3	1.0	.0262
Education content/online library (selected content)				
Info about Chantix	58.8	49.4	68.2	.0001
Slips and relapses	13.8	12.5	15.2	.2748

Table 3. Multivariate Models Predicting Abstinence at 6 Months (*OR*s and 95% *CI*s)

Models[a]	Web[b] *OR* (95% *CI*)	Phone[c] *OR* (95% *CI*)	Phone–Web[d] *OR* (95% *CI*)
# Calls	0.67 (0.42–1.08)	1.86 (1.47–2.35)	1.57 (1.25–1.98)
Call duration	1.04 (1.01–1.07)	0.99 (0.98–1.00)	0.99 (0.98–1.00)
Web logins	1.19 (1.08–1.31)	–	1.05 (0.96–1.15)
Web duration	1.00 (0.99–1.00)	–	1.00 (0.99–1.00)
Varenincline duration	1.02 (1.01–1.03)	1.02 (1.01–1.03)	1.02 (1.01–1.03)
	$\chi^2(8) = 62.5, p < .0001$	$\chi^2(6) = 63.5, p < .0001$	$\chi^2(6) = 46.6, p < .0001$

Note. OR = odds ratio.

[a]Models controlled for baseline variables determined to be significantly associated with outcome based on their stepwise addition to the base model containing the utilization variables.

[b]Baseline variables controlled for in the model: Heavy Smoking Index, ever used nicotine replacement therapy to quit, and support from family to quit.

[c]Baseline variables controlled for in the model: Fagerström Test for Nicotine Dependence, ever used other aids to quit, and Internet use.

[d]Baseline variables controlled for in the model: comfort conducting business online.

Varenicline utilization (average number of days used) also significantly differed by treatment group; $F(2, 987) = 4.96$, $p = .0072$: Web: 60.0 days ($SD = 35.7$), phone: 67.7 days ($SD = 31.3$), and phone–Web: 61.5 days ($SD = 32.7$). Pairwise comparisons revealed that the phone group used varenicline for significantly more days than the Web or phone–Web groups.

Utilization as a Predictor of Cessation Outcomes

Analyses were conducted to examine whether utilization predicts quit outcomes after controlling for baseline variables (see Table 3). Varenicline utilization was associated with increased abstinence in all intervention groups (odds ratio [OR] = 1.02 [95% *CI* = 1.01–1.03]). Within the Web group, call duration (*OR* = 1.04 [95% *CI* = 1.01–1.07]) and Web logins (*OR* = 1.19 [95% *CI* = 1.08–1.31]) were associated with increased abstinence. Within the phone and phone–Web groups, the number of calls completed (*OR*s = 1.86 [95% *CI* = 1.47–2.35], 1.57 [95% *CI* = 1.25–1.98], respectively) was associated with increased abstinence.

Correlates of Behavioral Treatment Utilization

Table 4 summarizes the results of the stepwise multivariate analysis conducted to determine the participant and baseline variables that predict behavioral treatment utilization. Significant final models are reported. In general, being older, prior use of treatments (bupropion, nicotine replacement therapy, or other aids), and the belief that certain treatments (phone, Web, and phone–Web groups) could improve the chance of success were associated with greater utilization of treatment (calls, logins, or time on calls/Web). Lower self-confidence, higher perceived stress, and depression were also associated with use.

Discussion

To our knowledge, this article is the first to concurrently examine treatment utilization in phone, Web, and phone–Web behavioral treatment programs and is the first to concurrently examine factors associated with greater utilization in each of these types of treatment programs. Consistent with prior research, we found that treatment utilization was significantly associated with cessation outcomes. Completing more calls was associated with greater abstinence in those groups randomized to receive phone counseling (i.e., the phone and phone–Web groups), while the time spent on the phone with a Quit Coach (not the number of calls completed) and the number of logins were associated with increased cessation rates in those participants randomized to Web-based services only. Several studies on phone-based interventions have demonstrated a dose–response relation between use and cessation outcomes (Curry et al., 1998; Hollis et al., 2007; Stead et al., 2006; Zhu et al., 1996). Likewise, in the growing body of research on Web-based interventions, all but one study (McKay et al., 2008) have found that the number of online logins is positively correlated with quit outcomes (An et al., 2008; Graham et al., 2007; Japuntich et al., 2006; Saul et al., 2007). Our study adds to this extant literature and extends it to include useful information on how utilization is associated with cessation outcomes in a combined phone–Web program.

Utilization of phone counseling was higher than Web utilization. Participants randomized to groups with phone counseling completed on average four of five calls, while the majority of participants randomized to groups with Web services used the Web less than two times and for a total of 30–50 min on average. The average number of calls completed in the COMPASS trial was higher than previously reported for the Quit For Life Program (approximately 4 calls vs. 2–2.5 calls; Zbikowski et al., 2008). The cause of this difference is unclear but may simply reflect the fact that volunteer research participants had a higher level of commitment and engagement than smokers typically treated in the "real world." Study-related access to a new medication not otherwise available at the study health plan (GH) may have enhanced this commitment. It also may reflect differences in demography and socioeconomic status among participants in the study health plan versus those treated in actual practice. Future research should seek to better understand how and why utilization outcomes differ between that observed in clinical trials and actual practice.

We observed a high percent of participants logging in at least once; however, in our previous work (Zbikowski et al., 2008), we observed zero logins as most common. We believe that the study protocol impacted utilization rates in several

Table 4. Multivariate Models Predicting Behavioral Treatment Utilization[a]

Baseline participant variables	Web group				Phone group		Phone–Web group			
	Number of calls	Call duration	Web logins	Web login duration	Number of calls	Call duration	Number of calls	Call duration	Web logins	Web login duration
Gender									.78 (.38)*	
Age	.02 (.01)***	.25 (.07)**		.65 (.29)*	.04 (.01)****	.76 (.14)	.03 (.01)***	.65 (.14)***	.05 (.02)**	
Being married					.33 (.17)*					
Smoking level						.39 (.19)*				
Confidence in quitting									−.53 (.21)*	−8.54 (2.78)**
Previous quit >6 month									−.83 (.36)*	
Previous use of nicotine replacement therapy				−16.88 (6.49)**	.48 (.22)*			12.88 (4.46)**		
Previous use of bupropion	.20 (.10)*		1.11 (.46)*							
Previous use of other aids							.45 (.17)**		.67 (.37)	12.08 (4.68)*
Ever obtained cessation info on the Internet			1.39 (.47)**	18.93 (6.44)**						9.20 (4.64)*
Improve chances of quitting—Web		−1.73 (.80)*							.37 (.17)*	5.64 (2.11)**
Improve chances of quitting—phone	.09 (.04)*	2.40 (.78)**	.72 (.20)***							
Improve chances of quitting—groups							.18 (.06)**	2.75 (1.30)*		
Encouragement from friends/coworkers							−.18 (.08)*	−5.09 (1.59)**		
Comfort doing business over the Internet									.34 (.13)*	
Perceived stress			−.21 (.08)**							
History of depression		3.35 (1.58)*								
Depression scale						4.80 (2.10)*		6.36 (2.55)*		
	$R^2 = .06$	$R^2 = .08$	$R^2 = .08$	$R^2 = .04$	$R^2 = .09$	$R^2 = .10$	$R^2 = .09$	$R^2 = .11$	$R^2 = .10$	$R^2 = .07$
	$F(3, 395) = 8.75$, $p < .0001$	$F(4, 394) = 8.12$, $p < .0001$	$F(4, 394) = 9.00$, $p < .0001$	$F(3, 395) = 5.91$, $p = .0006$	$F(3, 396) = 12.31$, $p < .0001$	$F(3, 396) = 15.16$, $p < .0001$	$F(4, 394) = 9.21$, $p < .0001$	$F(5, 393) = 10.14$, $p < .0001$	$F(7, 391) = 5.96$, $p < .0001$	$F(4, 394) = 6.97$, $p < .0001$

Note. [a]Stepwise multivariate analysis of variance models. Final model results are reported for each model along with the parameter estimate, *SE*, and level of significance for each variable remaining in the model.
*$p < .05$; **$p < .01$; ***$p < .001$; ****$p < .0001$.

ways. Participants in the Web group had a large percent of at least one logins due to the fact that they were required to set their quit date via the Web site in order to receive their medication. Additionally, participants in the Web group had a large number of ad-hoc calls (1/3 had at least one ad-hoc call). All Web group participants received a brief orientation call (to explain how to use the Web site) prior to starting the intervention, so it is possible that participants found it helpful to talk with a coach and as a result called back for additional support.

While many studies have explored the association between utilization of single treatment and outcomes, few have examined and compared predictors of multiple treatment programs. We identified several baseline participant variables as significant correlates of utilization, though only a few variables consistently predicted utilization: age, past use of cessation medications or other aids, and the belief that counseling/behavioral treatment programs improve the chances of quitting. We found that older smokers completed more calls, talked with a quit coach longer, logged in more, and spent more time online. Previous studies have varied with respect to findings regarding utilization of treatment and age. Japuntich et al. (2006) found age to be predictive of utilization, while Strecher et al. (2006) did not. We also found self-efficacy to be negatively correlated with Web utilization among participants in the phone–Web group. That is, individuals with lower confidence in quitting were more likely to use the Web-based services. Similarly, Danaher et al. (2008) found that self-efficacy was an important mediator of outcomes in a Web-based intervention for smokeless tobacco users; however, utilization was no longer significantly related to outcomes after taking self-efficacy into account. Strecher did not identify self-efficacy to be a moderator of treatment outcomes (Strecher et al., 2006). Similar to other studies (Japuntich et al., 2006; Strecher et al., 2006), we found that gender, ethnicity, education, motivation, baseline cigarette use, nicotine dependence, and stress were not significant moderators of treatment.

Limitations and Strengths

There are several limitations and strengths of this study to consider. First, the present study described utilization of treatment, but we cannot draw conclusions from these data about how engaged or compliant participants were in using the behavioral strategies and skills taught. Second, we defined utilization as the number and duration of counseling calls and Web logins: Our results generalize to other studies with similar outcomes. Some Web efficacy studies have observed and reported amount of content read or used. The tracking program used for the Web program allowed us to track visits to the Web site (logins) as well the time spent on each feature. While time spent gives provides an estimate of use, it may not fully represent the degree of actual engagement with Web content.

All study participants received varenicline, a powerful and new medication, which may have influenced utilization patterns. The phone version of the program was a mature offering, having been in use for over 20 years, whereas the Web version had just been created. Thus, perhaps a more seasoned Web program may have higher rates of utilization. Finally, we did not assess why participants stopped using treatment services. Future studies may benefit from assessing reasons why participants stop using a treatment. This information may be beneficial for modifying existing or developing new treatments.

Despite these limitations, this study has a number of strengths. Among them is our examination of utilization across three different behavioral treatment programs, the inclusion of a combined phone–Web program, and the fact that all study participants had access to the same pharmacotherapy, thus holding any influence of the study medication on behavioral treatment constant for all participants. The study also adds to the body of literature on predictors of cessation treatment utilization and provides more evidence for the importance of assessing utilization as a mediator of research findings.

Although this study used a specific tobacco cessation program (Quit For Life), the findings have real-world importance. The Quit For Life Program is currently offered in over half of the U.S. state tobacco quitlines (in 26 states, Washington DC, and the territory of Guam) and over 350 employer and health plans nationwide. Each year, over 250,000 tobacco users enroll in this treatment program. Additionally, the results likely generalize to other similar phone and Web-based programs that incorporate best-practice standards from the Clinical Practice Guidelines (Fiore et al., 2008) and are designed to increase self-efficacy, problem solving and coping based on Social Cognitive Theory.

Implication for Future Treatments and Studies

It may be beneficial for behavioral programs to be tailored with consideration for participant characteristics (e.g., age, self-efficacy) and treatment experience and expectancies. Our study suggests that different approaches may be needed to engage younger smokers. It is possible that younger smokers think they can quit on their own or need little assistance. This population may particularly benefit from education (online or from a coach) about how the use of services can improve cessation outcomes. As reported above, we also found that attitudes toward treatment, in particular expected outcomes, affected utilization. Further research is needed to explore ways to capitalize on this information to improve participation. One possible idea is to have programs collect this information from participants when they enroll in programs and for coaches/specialists to address possible opinions and biases that enrollees may have that may affect utilization. Alternatively, if such beliefs drive people to use programs and ultimately achieve success, cessation programs can use this type of information to triage participants to programs and services they are inclined to use most and benefit from.

Declaration of Interests

Dr. SMZ and Ms. MD are employed by Free & Clear, Inc. Dr. TAM was employed by Free & Clear, Inc. at the time the

References

An, L. C., Schillo, B. A., Saul, J. E., Wendling, A. H., Klatt, C. M., Berg, C. J., et al. (2008). Utilization of smoking cessation informational, interactive, and online community resources as predictors of abstinence: Cohort study. *Journal of Medical Internet Research*, *10*, e55. doi:10.2196/jmir.1018

Cobb, N. K., Graham, A. L., Bock, B. C., Papandonatos, G., & Abrams, D. B. (2005). Initial evaluation of a real-world Internet smoking cessation system. *Nicotine & Tobacco Research*, *7*, 207–216. doi:10.1080/14622200500055319

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*, 385–396.

Curry, S. J., Grothaus, L. C., McAfee, T. A., & Pabiniak, C. (1998). Use and cost effectiveness of smoking-cessation services under four insurance plans in a health maintenance organization. *New England Journal of Medicine*, *339*, 673–679.

Danaher, B. G., Smolkowski, K., Seeley, J. R., & Severson, H. H. (2008). Mediators of a successful web-based smokeless tobacco cessation program. *Addiction*, *103*, 1706–1712. doi:10.1111/j.1360-0443.2008.02295.x

Derogatis, L. R., Lipman, R. S., Rickels, K., Uhlenhuth, E. H., & Covi, L. (1974). The Hopkins Symptom Checklist (HSCL): A self-report symptom inventory. *Behavioral Science*, *19*, 1–15.

El-Bastawissi, A., McAfee, T. A., Zbikowski, S. M., Hollis, J., Stark, M., Wassum, K., et al. (2003). The uninsured and Medicaid Oregon tobacco user experience in a real world, phone based cessation programme. *Tobacco Control*, *12*, 45–51. doi:10.1136/tc.12.1.45

Etter, J. F. (2005). Comparing the efficacy of two Internet-based, computer-tailored smoking cessation programs: A randomized trial. *Journal of Medical Internet Research*, *7*, e2. doi:10.2196/jmir.7.1.e2

Fiore, M. C., Jaen, C. R., Baker, T. B., Bailey, W. C., Benowitz, N. L., Curry, S. J., et al. (2008). *Treating tobacco use and dependence: 2008 update. Clinical Practice Guideline*. Rockville, MD: US Department of Health and Human Services. Public Health Service.

Graham, A. L. P., Cobb, N. K. M., Raymond, L. M., Sill, S. M., & Young, J. M. (2007). Effectiveness of an Internet-based worksite smoking cessation intervention at 12 months. *Journal of Occupational & Environmental Medicine*, *49*, 821–828. doi:10.1097/JOM.0b013e3180d09e6f

Halperin, A. C., McAfee, T. A., Jack, L. M., Catz, S. L., McClure, J. B., Deprey, T. M., et al. (2008). Impact of symptoms experienced by varenicline users on tobacco treatment in a real world setting. *Journal of Substance Abuse Treatment*, *36*, 428–434. doi:10.1016/j.jsat.2008.09.001

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerström, K. O. (1991). The Fagerström test for nicotine dependence: A revision of the Fagerström tolerance questionnaire. *British Journal of Addiction*, *86*, 1119–1127.

Hollis, J. F., McAfee, T. A., Fellows, J. L., Zbikowski, S. M., Stark, M., & Riedlinger, K. (2007). The effectiveness and cost effectiveness of telephone counselling and the nicotine patch in a state tobacco quitline. *Tobacco Control*, *16*, i53–i59. doi:10.1136/tc.2006.019794

Japuntich, S. J., Zehner, M. E., Smith, S. S., Jorenby, D. E., Valdez, J., Fiore, M. C., et al. (2006). Smoking cessation via the Internet: A randomized clinical trial of an Internet intervention as adjuvant treatment in a smoking cessation intervention. *Nicotine & Tobacco Research*, *8*, 59–67. doi:10.1080/14622200601047900

Lenert, L., Munoz, R. F., Perez, J. E., & Bansond, A. (2004). Automated e-mail messaging as a tool for improving quit rates in an Internet smoking cessation intervention. *Journal of the American Medical Informatics Association*, *11*, 235–240. doi:10.1197/jamia.M1464

Lichtenstein, E., Glasgow, R. E., Lando, H. A., Ossip-Klein, D. J., & Boles, S. M. (1996). Telephone counseling for smoking cessation: Rationales and meta-analytic review of evidence. *Health Education Research*, *11*, 243–257.

McAfee, T. A., Bush, T., Deprey, M., Mahoney, L., Zbikowski, S. M., Fellows, J., et al. (2008). Nicotine patches and uninsured quitline callers: A randomized trial of two versus eight weeks. *American Journal of Preventive Medicine*, *35*, 103–110. doi:10.1016/j.amepre.2008.04.017

McClure, J. B., Swan, G. E., Jack, L. M., Catz, S. L., Zbikowski, S. M., McAfee, T. A., et al. (2009). Mood, side-effects and smoking outcomes among persons with and without probable lifetime depression taking varenicline. *Journal of General Internal Medicine*, *24*, 563–569. doi:10.1007/s11606-009-0926-8

McKay, H. G., Danaher, B. G., Seeley, J. R., Lichtenstein, E., & Gau, J. M. (2008). Comparing two web-based smoking cessa-

tion programs: Randomized controlled trial. *Journal of Medical Internet Research*, *10*, e40. doi:10.2196/jmir.993

Myung, S. K., McDonnell, D. D., Kazinets, G., Seo, H. G., & Moskowitz, J. M. (2009). Effects of web- and computer-based smoking cessation programs: Meta-analysis of randomized controlled trials. *Archives of Internal Medicine*, *169*, 929–937.

Orleans, C. T., Schoenbach, V. J., Wagner, E. H., Quade, D., Salmon, M. A., Pearson, D. C., et al. (1991). Self-help quit smoking interventions: Effects of self-help materials, social support instructions, and telephone counseling. *Journal of Consulting & Clinical Psychology*, *59*, 439–448.

Pike, K. J., Rabius, V., McAlister, A. L., & Geiger, A. (2007). American Cancer Society's QuitLink: Randomized trial of Internet assistance. *Nicotine & Tobacco Research*, *9*, 415–420. doi:10.1080/14622200701188877

Rabius, V., Pike, K. J., Wiatrek, D., & McAlister, A. L. (2008). Comparing Internet assistance for smoking cessation: 13-month follow-up of a six-arm randomized controlled trial. *Journal of Medical Internet Research*, *10*, e45. doi:10.2196/jmir.1008

Ringen, K., Anderson, N., McAfee, T. A., Zbikowski, S. M., & Fales, D. (2002). Smoking cessation in a blue-collar population: Results from an evidence-based pilot program. *American Journal of Industrial Medicine*, *42*, 367–377. doi:10.1002/ajim.10129

Saul, J. E., Schillo, B. A., Evered, S., Luxenberg, M. G., Kavanaugh, A. M., Cobb, N., et al. (2007). Impact of a statewide internet-based tobacco cessation intervention. *Journal of Medical Internet Research*, *9*, e28. doi:10.2196/jmir.9.4.e28

Severson, H. H., Gordon, J. S., Danaher, B. G., & Akers, L. (2008). ChewFree.com: Evaluation of a Web-based cessation program for smokeless tobacco users. *Nicotine & Tobacco Research*, *10*, 381–391. doi:10.1080/14622200701824984

Shiffman, S., Kassel, J., Gwaltney, C. J., & McChargue, D. (2005). Relapse Prevention for Smoking. In G. A. Marlatt & D. M. Donovan (Eds.), *Relapse prevention: maintenance strategies in the treatment of addictive behaviors* (2nd ed, pp. 92–129). New York: Guilford Press.

Stead, L. F., Perera, R., & Lancaster, T. (2006). Telephone counseling for smoking cessation. *Cochrane Database of Systematic Reviews*, (*3*). doi:10.1002/14651858.CD002850.pub2

Strecher, V. J., McClure, J., Alexander, G., Chakraborty, B., Nair, V., Konkel, J., et al. (2008). The role of engagement in a tailored web-based smoking cessation program: Randomized controlled trial. *Journal of Medical Internet Research*, *10*, e36. doi:10.2196/jmir.1002

Strecher, V. J., Shiffman, S., & West, R. (2005). Randomized controlled trial of a web-based computer-tailored smoking cessation program as a supplement to nicotine patch therapy. *Addiction*, *100*, 682–688. doi:10.1111/j.1360-0443.2005.01093.x

Strecher, V. J., Shiffman, S., & West, R. (2006). Moderators and mediators of a Web-based computer-tailored smoking cessation program among nicotine patch users. *Nicotine & Tobacco Research*, *8*, 95–101. doi:10.1080/14622200601039444

Swan, G. E., McAfee, T. A., Curry, S. J., Jack, L. M., Javitz, H., Dacey, S., et al. (2003). Effectiveness of bupropion sustained release for smoking cessation in a health care setting: A randomized trial. *Archives of Internal Medicine*, *163*, 2337–2344.

Swan, G. E., McClure, J. B., Jack, L. M., Zbikowski, S. M., Javitz, H. S., Catz, S. L., et al. (2010). Behavioral counseling and varenicline treatment for smoking cessation. *American Journal of Preventive Medicine*, *38*, 482–490. doi:10.1016/j.amepre.2010.01.024

Zbikowski, S. M., Hapgood, J., Smucker Barnwell, S., & McAfee, T. A. (2008). Phone and web-based tobacco cessation treatment: Real-world utilization patterns and outcomes for 11,000 tobacco users. *Journal of Medical Internet Research*, *10*, e41. doi:10.2196/jmir.999

Zhu, S., Stretch, V., Balabanis, M., Rosbrook, B., Sadler, G., & Pierce, J. P. (1996). Telephone counseling for smoking cessation: Effects of single-session and multiple session interventions. *Journal of Consulting & Clinical Psychology*, *64*, 202–211.