Clinical Outcomes Resulting from Proactive Reengagement by a Tobacco Quitline (FINAL)

Disclaimer: The views expressed are those of the authors and do not reflect the official views or policy of the Department of Defense or its components. The voluntary, fully informed consent of the subjects used in this research was obtained as required by 32 CFR 219 and DoDI 3216.02_AFI40-402.

Abstract

The purpose of the current study was to determining the degree to which 12-month quitline quit rates can be improved with reengagement of callers whose first dose of quitline treatment failed to establish abstinence. Participants were 614 TRICARE insurance beneficiaries, each of whom received a validated, four-session tobacco cessation tobacco cessation intervention with an option for free nicotine replacement therapy (NRT). A scheduled three-month check-in afforded callers who had not yet achieved abstinence to reengage with additional quitline counseling. Resulting were three caller groups: (1) those who were abstinent at three-month check-in, (2) those who were still smoking at three months, and who accepted the invitation to reengage with proactive tobacco quitline treatment, and (3) individuals who were still smoking at three months, but who declined the opportunity to reengage for a second dose of quitline treatment. Comparison of the three groups demonstrated a 9.6-times higher odds of abstinence at the 12-month follow-up for those who had achieved abstinence at three months relative to those in the reengaged group (OR=9.6, 95% CI: 5.2-17.8; Bonferroni adjusted $p<0.0001$). The difference in 12-month smoking status between those still smoking at three-months who reengaged and declined the opportunity to reengage directionally advantaged reengagement, but failed to reach statistical significance (OR=1.39, 95% CI: 0.68-2.85, $p=0.367$). Implications of these results for tobacco quitlines' treatment of callers whose initial quit attempt was unsuccessful are discussed.

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Introduction

Tobacco is the single most preventable cause of death in the U.S. (U.S. Department of Health and Human Services, 2014), and veterans of the U.S. Military use tobacco products at a rate higher than their civilian counterparts (Odani et al., 2018). In 2016, the Secretary of Defense issued a memorandum (Memorandum 16-001; Carter, 2016) calling for action to address the high prevalence of tobacco use in the military. The memo mandated dramatic increases in the cost of tobacco products in military stores, establishing price parity with historically more expensive off-base establishments, and it also called for improved and expanded tobacco cessation programs.

The Defense Health Agency-administered health system, TRICARE, serves over 9.6 million retirees, family members, and active duty military members living and working in countries around the world (Military Health System, 2022), and so shares with national and state public health interests a common challenge germane to tobacco control: how best to reach millions of smokers seeking to quit. Available anywhere there is phone service, tobacco quitlines offer a compelling combination of reach and effectiveness (Lichtenstein et al., 2010). Proactive quitlines (i.e., those which pre-schedule sessions and then call participants on the appointed day and time) produce better outcomes relative to reactive quitlines (i.e., those in which participants must call to initiate each interaction; Tzelepis et al., 2011), and this general effect has been replicated with active duty military and TRICARE beneficiaries, for whom proactive treatment has doubled the odds of abstinence from tobacco at a 12-month follow-up (Klesges et al., 2015). But even here, a majority of those who desired to quit failed to do so, and half of smokers who quit during treatment had re-initiated by the 12-month follow-up (Klesges et al, 2015). The decay of tobacco cessation treatment effects over time is firmly established in the tobacco control literature (e.g., Zhu et al., 2002; Diemert et al., 2016). As a result, a growing body of research has developed around how best to reengage quitline callers whose initial quit attempt was not successful.

Emerging evidence suggests that reengagement efforts made by quitlines function to increase the probability that participants will make subsequent quit attempts. Vickerman and colleagues (2018), for example, observed a 5-fold increased odds of reengagement as a consequence of proactive telephonic outreach by quitline staff between

one to three months after the initial quit attempt, and a more extensive literature dating back nearly 10 years characterizes phone contact as effective in reengaging 12-28% of quitline participants who failed a previous quit attempt (Carlini et al., 2012; Carlini et al., 2015; Vickerman, 2018). Still unclear, by contrast, is the tobacco use trajectory of those participants who do reengage with quitline services following a failed quit attempt. Characterization of the effectiveness of such reengagement efforts will assist quitlines in determining how best to allocate finite personnel and financial resources – that is, should quitlines aim to reengage callers after an unsuccessful attempt or intensify the initial round of counseling to bolster the rate of abstinence within the first three months of counseling? Answering this question will enable quitlines to improve outcomes.

The current study sought to address this gap in the literature by determining the degree to which quitline abstinence rates can be improved with reengagement of callers whose first dose of quitline treatment failed to establish abstinence. To this end, we compared long-term tobacco use rates across three groups of participants: (1) those who were abstinent at three-month check-in, (2) those who were still smoking at three months, and who accepted the invitation to reengage with proactive tobacco quitline treatment, and (3) individuals who were still smoking at three months, but who declined the opportunity to reengage for a second dose of quitline treatment.

Methods

Study Design

This evaluation is part of a larger NHLBI-funded grant (R01 HL123978) that randomized participants who were still smoking three months following an initial bout of quitline intervention comprising counseling and nicotine replacement therapy and who were willing to try again, into three reengagement conditions: rate reduction, repetition of the initial four session treatment, or their choice of the preceding treatments. Dubbed the 'Freedom Quitline', the resulting study provided smoking cessation treatment to TRICARE beneficiaries from 2017 through 2020. For the present, secondary analysis, the dependent variable was seven-day point prevalence at 12-month follow-up, and the independent variable was smoking status (i.e., quit or not quit and thus reengaged) at three months following the initial bolus of quitline counseling.

Participants

Recruited participants were 614 adult TRICARE beneficiaries, including active duty and retired military

personnel from the Army, Navy, Air Force, Marines, and Coast Guard, and those among their family members covered under their insurance. Eligible participants were at least 18 years of age and had smoked at least five cigarettes daily over the preceding year and were willing to make a quit attempt in the next 30 days. Because participation entailed access to Nicotine Replacement Therapy (NRT), those with a pre-identified allergy to nicotine, or with an unstable heart condition, were excluded from the study.

Procedure

Participants engaged in four proactively initiated telephonic smoking cessation calls executed in conjunction with mailing of an 8-week supply of 7-21mg nicotine patch therapy (contingent upon baseline smoking rate). Following the initial round of counseling, participants were informed they would be contacted in 3-months for assessment of their tobacco use status. Those who were not quit at the three-month check-up were offered the opportunity to reengage with an additional round of proactive quitline counseling. For the purposes of this investigation we were interested in how re-engagement at three months improved outcomes at 12-month follow-up. We were also interested in how participants who reengaged compared at 12 months to those who had either reported abstinence at the three-month check-up or were still smoking but declined the opportunity to reengage, and for this reason all participants were again queried concerning their tobacco use status at 12-months post-initiation of the initial dose of quitline treatment. All counselors participating in the study received extensive training in motivational interviewing, including a two-day workshop, weekly skills training, and monthly individual feedback on audio recordings of their interactions with quitline callers. Initial motivational interviewing proficiency and subsequent fidelity checks were accomplished with reference to the Motivational Interviewing Treatment Integrity Code (MITI 3.1.1; Moyers, et al., 2010). This protocol was approved by the Institutional Review Board (IRB) of the 59th Medical Wing, Joint Base San Antonio-Lackland, Texas.

Measures

Intensity of physical addiction to nicotine was evaluated using the Fagerström Test for Nicotine Dependence (FTND; Heatherton et al., 1991).

Number of cigarettes smoked per day, number of years smoked, lifetime number of quit attempts, and use

of NRT and additional prescription smoking cessation aids all were queried directly.

Seven-day point prevalence was defined as the self-report absence of tobacco use within the seven days preceding three-month check-in and 12-month follow-up.

Statistical Methods

Because participants could not be randomly assigned (i.e., to be, at three months, either abstinent or, if still smoking, to reengage with or decline an additional dose of quitline counseling), we used propensity score methods (Austin, 2009) to adjust for participants' treatment selection bias. The propensity score was defined as the probability of assignment to treatment conditional based upon a participant's set of observed risk factors that may influence the decision to reengage at the three-month check-in. The propensity score was created using a multivariable logistic regression model with reengagement as the dependent variable. The independent variables included participants' demographic variables, including age, gender, race, education, marital status, military status, baseline FTND scores, the first three-month treatment adherence (measured as number of counseling sessions attended and NRT use), and additional NRT or other medications use. The propensity score weighting was also incorporated into the outcome analysis to assess for differences in seven-day smoking abstinence rates at 12-month follow-up among those who reengaged, declined to reengage, or who achieved abstinence by the three-month check-in. The area under the receiver operator characteristic (ROC) curve, or 'C index', from the final model was used as a measure of overall predictive discrimination, which is defined in this study as the ability to differentiate participants who quit tobacco by the 12-month follow-up from those who did not. A ROC curve of 0.5 indicates no discrimination, whereas a ROC curve of 1.0 indicates perfect discrimination. To control type I error rate due to multiple comparisons, Bonferroni multiple comparison adjustment was applied. The overall significance level was specified at 0.05. All analyses were performed using SAS 9.4 (SAS Institute Inc., Cary, NC).

Results

Of 490 (79.8%) participants contacted at three months following a standard smoking cessation intervention, 226 (46.1%) reported abstinence and 264 (53.9%) were still smoking following an initial quit attempt (Figure 1). Of 264 who were still smoking, 134 (50.8%) were willing to reengage for additional treatment.

Comparisons of demographic and tobacco use characteristics by smoking status at three months (i.e.,

abstinent; smoking and agreed to reengage with quitline; smoking but declined to reengage) are presented in Table 1. Persons abstinent from tobacco at three months were disproportionately white (p=0.033) and military service members on Active Duty (p=0.024). Those not smoking at the three-month follow-up reported a history of lighter daily smoking at baseline (p=0.010) and had lower FTND scores (p=0.001), were more likely to use NRT during the first three-months of study's intervention period (p<0.0001), were more likely to use additional medications (p<0.0001).

Overall, 23.8% (n = 30) of participants who reengaged for additional treatment at three months were quit at the 12-month follow-up, driving the quitline's overall (i.e., one-year) quit rate to 46.4%. Among those whose initial quit attempt succeeded, and who reported abstinence at three months, 74.6% (n = 159) were quit at 12 months. Comparison of the three groups in the context of a final model utilizing propensity score weighting to minimize treatment selection bias at the three-month check-in demonstrated a 9.6-times higher odds of abstinence at the 12-month follow-up for those who had achieved abstinence at three months relative to those in the reengaged group (OR=9.6, 95% CI: 5.2-17.8; Bonferroni adjusted p<0.0001), and those in the early success group also demonstrated higher odds of abstinence relative to those in the declined to reengaged group (OR=13.4, 95% CI: 6.8-26.8; Bonferroni adjusted p<0.0001). Notably, those who received only one cycle of treatment (i.e., either declined to reengage or had achieved abstinence by the three-month check-in) were more than 2.6 times likely to be quit at 12-month follow-up than those who received two cycles of treatment (OR=2.6, 95% CI: 1.5-4.7, Bonferroni adjusted p=0.004). The reengagement group did not have a significantly higher odds of smoking abstinence at 12 months compared to those who still were smoking at the three month check-in, but who declined the offer to reengage with a second cycle of treatment (OR=1.39, 95% CI: 0.68-2.85, p=0.367, see Table 2), though the direction of the treatment effect suggested that additional treatment may be beneficial. The C-index of 0.77 from the final propensity score weighting logistic regression model indicated that this model had very good predictive discrimination power between participants who were abstinent at 12-month follow-up and who were not.

Discussion

In the current study, we evaluated the impact of proactive reengagement on the performance of a tobacco quitline, expressed in terms of seven-day point prevalence at 12 months following the initial round of treatment. Overall, we observed that a tobacco quitline with an option for reengagement resulted in a 46.4% quit rate at one year post initial intervention. Such performance exceeds that associated with most multi-component, face-to-face

smoking cessation interventions the typical quit rates for which reside in the vicinity of 33% (North American Quitline Consortium, 2021), and we had anticipated that using proactive counseling to reengage callers whose initial quit attempt had failed would improve cessation outcomes. In fact, our results suggest that proactive reengagement of callers still smoking at a three-month check-in markedly improved their chances of sustained abstinence at 12 months. Though effective in producing a meaningful number of additional quits, reengagement (i.e., two 'cycles' of treatment) fell well-short of a successful first bout of treatment with regard to the rate of cessation observed at one year. We underestimated the rate at which quitline callers would decline the opportunity to reengage, and it is conceivable that a stronger effect for reengagement would have emerged had we achieved adequate statistical power to detect a difference for this group.

Our observation that 24% of participants who agreed to reengage were abstinent at 12 months supports the utility of proactive reengagement for the 53.9% of participants who were still smoking three months subsequent to their initial quit attempt. Berman, Crane, Seiber, and Muner (2014) have estimated that each smoker generates, on average, an additional $2,056 in healthcare expenses annually, given which the 30 quits we enabled through reengagement may have saved the Military Health System up to $122,000 in the year following the study period. The value of this strategy is predicated upon an assumption that these callers would have continued smoking, had they not been given the opportunity to reengage with treatment. Under such an assumption, overall quitline performance would have attenuated by 6.6% in absence of reengagement, and from this perspective the strategy appears to have resulted in a beneficial effect on the overall performance of the quitline The utility of reengagement is further reinforced by our observation that callers who were still smoking at the three-month check-in but declined reengagement, had an estimated 12-month quit rate 4.3% lower compared to those who reengaged.

Results from a comparison of callers who reengaged with those who had achieved abstinence by the three-month check-in were striking. We had anticipated that the reengaged group's more recent, and generally larger overall volume of quitline contact would render their cessation rate comparable to that observed for those who had achieved abstinence in the first three months of the study. Predictably, those who were abstinent at the three-month check-in were nearly 10 times more likely than those who reengaged to be quit at the 12-month follow-up. Propensity score adjustment allowed us to balance for select characteristics, including baseline severity of tobacco dependence and the use of available nicotine replacement therapy during the study period, which distributed unequally across the two groups. The fact that early abstinence outperformed reengagement, even after the

propensity score weighting adjustment, introduces the possibility that quitlines wishing to incorporate reengagement should also seriously consider investing in services (e.g., tailored text messages; stepped-care support) which maximize the probability of a quit within the first three months of treatment.

Early success emerges as especially important in light of previous research demonstrating the diminishing likelihood of a successful quit with a failed attempt in the preceding year, a phenomenon which strengthens with multiple such failed attempts at abstinence over the same period (Partos et al., 2013). A Phase-Based Model (PBM; Schlam & Baker, 2013) for the structuring of tobacco cessation efforts seeks to optimize smokers' prospects for a successful quit across a spectrum spanning from initial motivation, into preparation for behavior change, transversing the cessation attempt itself, and extending ultimately through the potential for relapse and recovery. Each of our participants was motivated to quit, having elected to call the quitline and subsequently engaged with an intervention organized around the principles of motivational interviewing, and all callers participated in preparatory counseling broadly consistent with that outlined by Piper and colleagues (2016). Emerging evidence for an additive effect of maintenance counseling in conjunction with extended use of NRT suggests that we may have achieved a better outcome for those who ultimately were not abstinent at three months during the 'cessation' phase – albeit at higher cost – had we interspersed the two months following the core intervention with bi-weekly phone contacts (Schlam et al., 2016). Latent class analysis has been used to successfully identify smokers for whom supplemental support may be indicated (McCarthy, et al., 2015), introducing the possibility that additional phone contacts could, in the future, be extended with increasing precision to smokers in need.

While nearly 70% of smokers wish to quit (MMWR, 2011), only a subset of especially motivated persons elects to engage with quitline counseling on any given month (Papadakis, et al., 2016). It is thus critical that quitline services be organized and executed in a manner which maximizes callers' potential for successful tobacco cessation. Taken in context of the existing literature, our results raise the possibility that the right 'dose' of quitline treatment cannot be defined by a set number of calls irrespective of the individual, and should instead be understood in terms of each caller's needs as anticipated by empirically-derived predictors of treatment response (e.g., perceived self-efficacy, and sleep status; McCarthy et al., 2015) and informed by their manifest response to treatment in the days and weeks following their target quit date. We extended an invitation to reengage at three months, and this may have proved up to 90 days too late, depending upon the caller.

Strengths of the present study include treatment conditions featuring counseling and NRT consistent with

prevailing Clinical Practice Guidelines (AHRQ, 2008), in addition to proactive engagement of callers following the initial quitline contact, which thereby limited the influence of extraneous variables on callers' ongoing engagement with the quitline. Each of our counselors was trained to demonstrable proficiency in motivational interviewing using the Motivational Interviewing Treatment Integrity Code (MITI 3.1.1; Moyers, et al., 2010), and received feedback on randomly selected audiotaped quitline calls throughout the study period. Standardization of training and intervention delivery enabled isolation of variables, including reengagement status, which were of central interest to the study.

A relative weakness of this study which limits our ability to make strong inferences from these data is the exploratory nature of the analyses, residing as it they do within a larger project specifically designed to evaluate the relative merits of three distinct reengagement strategies. Consequently, what is, for the present purpose, referred to as 'reengagement' comprises rate reduction, repetition of the earlier intervention, or the caller's choice between the two, and these alternatives appear not to be commensurately effective (see Klesges et al., 2021, for details). Caller tobacco use status also was ascertained by self-report, rather than empirically by means of salivary cotinine sampling. Finally, because we defined the one-year outcome as 12 months from completion of the first dose of quitline contact, we are limited in our ability to make strong inferences concerning the durability of quits resulting from reengagement, which occurred only 9 months in advance of the one-year follow-up.

Taken together, our results suggest that, while reengagement appears to be of benefit to those smokers for whom an initial round of treatment was unsuccessful, persons who succeed in achieving abstinence within that initial round of treatment are substantially more likely to be quit at one year relative to their reengaged counterparts. Consequently, future research should seek to set on empirical footing a framework through which to tailor the dose and timing of supplemental tobacco cessation services inside the three months immediately following each caller's target quit date, as success in this respect stands to increase considerably the corresponding 12-month quit rate.

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Figure 1

Consort Diagram

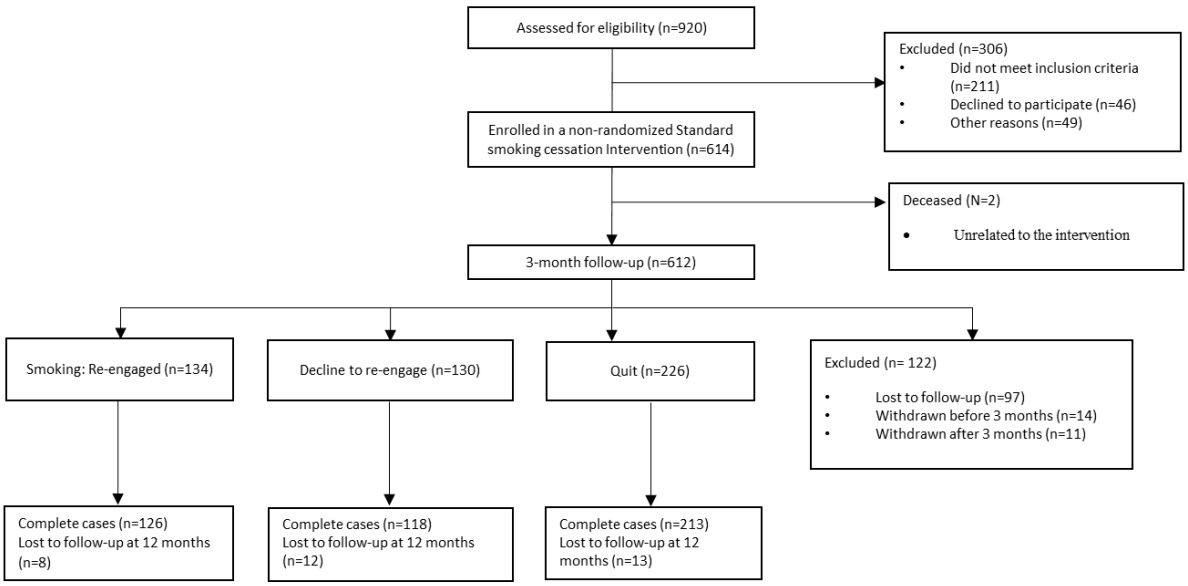

Table 1

Descriptive Statistics by 3-month Smoking Status

Variable	Reengaged (n=134)	Declined to Reengage (n=130)	Abstinent (n=226)	P-value
At Baseline:				
Age	49.0 (34.0, 52.4, 63.0)	48.3 (32.6, 50.3, 62.8)	49.4 (34.4, 53.6, 62.0)	0.863
Gender: Male	66 (49.3)	73 (56.1)	137 (60.6)	0.111
Female	68 (50.8)	57 (43.9)	89 (39.4)	
Race: White	98 (73.1)	110 (84.6)	188 (83.2)	**0.033**
African American	24 (17.9)	14 (10.8)	26 (11.5)	
Other races	12 (9.0)	6 (4.6)	12 (5.3)	
Ethnicity: Non-Hispanic	120 (90.2)	121 (93.8)	198 (87.6)	0.176
Hispanic	13 (9.8)	8 (6.2)	28 (12.4)	
Education: High school diploma or GED	29 (21.6)	24 (18.5)	38 (16.8)	0.438
Some college/vocational school/Associates Degree	74 (55.2)	64 (49.2)	120 (53.1)	
Bachelor's Degree or post college	31 (23.1)	42 (32.3)	68 (30.1)	
Military status: Dependent	60 (44.8)	45 (34.6)	67 (29.7)	**0.024**
Active	29 (21.6)	44 (33.9)	79 (35.9)	
Retired	45 (33.6)	41 (31.5)	80 (35.4)	
Marital status: Single/Widowed/Divorced/Separated	38 (28.4)	40 (30.8)	59 (26.1)	0.639
Married/Living as married	96 (71.6)	90 (69.2)	167 (73.9)	
Number of cigarettes per day	17.6 (10.0, 20.0, 20.0)	18.0 (10.0, 20.0, 20.0)	15.5 (10.0, 15.0, 20.0)	**0.010**
Years smoked	28.7 (13.0, 30.0, 42.0)	29.1 (15.0, 25.0, 44.0)	26.6 (13.0, 25.0, 40.0)	0.285
Fagerström score (FTND)	4.7 (3.0, 5.0, 6.0)	4.4 (3.0, 5.0, 6.0)	3.8 (2.0, 4.0, 5.0)	**0.001**
At 3-month:				
Number of counseling sessions attended	3.2 (3.0, 4.0, 4.0)	2.7 (2.0, 3.0, 4.0)	3.5 (4.0, 4.0, 4.0)	< **0.0001**
NRT use: No	41 (30.6)	65 (50.0)	40 (17.7)	< **0.0001**
Yes	93 (69.4)	65 (50.0)	186 (82.3)	
Additional medication use: No	15 (11.2)	53 (40.8)	19 (8.4)	< **0.0001**
Yes	119 (88.8)	77 (59.2)	207 (91.6)	

Note: Categorical variables were displayed as frequency (%) and continuous variables were displayed as mean (1st quartile, median, 3rd quartile). P-value was derived from Fisher's Exact test for the categorical variables and Kruskal-Wallis test for the continuous variables.

Table 2

Treatment Effects of 3-month Smoking Status in Predicting Probability of Past-7-day Abstinence at 12-month Follow-up

Comparison	**Odds Ratio**	**Lower 95% CI**	**Upper 95% CI**	**p-value**
Abstinent (1-cycle) vs. Declined to reengage (1-cycle)	13.39	6.81	26.32	<.0001
Abstinent (1-cycle) vs. Reengaged (2-cycle)	9.63	5.21	17.80	<.0001
Others (1-cycle) vs. Reengaged (2-cycles)	2.63	1.48	4.68	0.001
Reengaged (2-cycle) vs. Declined to reengage (1-cycle)	1.39	0.68	2.85	0.367

Note: The model was adjusting for the propensity score weighting to minimize potential selection bias at three-month check-in. 'Others' included participants who declined to reengage or were abstinent at the three-month check-in