



Engagement and abstinence among users of a smoking cessation text message program for veterans



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HIGHLIGHTS

- SmokefreeVET users were grouped into classes based on engagement pattern.
- Highly engaged users were significantly more likely to report abstinence.
- Use of smoking cessation medications was positively associated with abstinence.
- User engagement may serve as a measure of intervention intensity.

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ABSTRACT

Background: SmokefreeVET is a text messaging smoking cessation program available to veterans enrolled in the Veterans Health Administration. SmokefreeVET was developed in collaboration with the National Cancer Institute as part of the SmokefreeTXT initiative.

Purpose: To evaluate the real world use of and effectiveness of the SmokefreeVET program for SmokefreeVET users who enrolled between 2013 and 2014.

Methods: Demographics and smoking behavior of 1470 SmokefreeVET users who enrolled between 2013 and 2014 were analyzed. Latent growth mixture modeling was used to identify discrete classes of SmokefreeVET users based on engagement patterns. Multi-level modeling determined class differences in abstinence.

Results: The average age of the SmokefreeVET user was 48, 75% of users were male, and 84% were daily smokers. After five weeks, 13% of all users reported abstinence from smoking. Five statistically distinct engagement classes of SmokefreeVET users were identified. Highly engaged classes were significantly less likely to opt-out and more likely to report abstinence. Over 60% of users who were classified as high engagers throughout the program reported abstinence 5 weeks after their quit date. Users were more likely to report abstinence after two weeks if they used smoking cessation medication than those that did not use medication ($OR = 9.01, p < 0.001$).

Conclusions: SmokefreeVET may be effective at supporting abstinence among a real world group of highly engaged users. Smoking cessation medication use was also associated with abstinence in SmokefreeVET users. Engagement appears to be a critical component when assessing the efficacy of a text messaging smoking cessation intervention.

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1. Introduction

The Veterans Health Administration (VHA) is the largest integrated health care system in the U.S. with over 9 million U.S. military veterans enrolled (U.S. Department of Veterans Affairs, 2015). Tobacco use is the

leading cause of preventable death and disease in the United States (U.S. Department of Health and Human Services, 2014), and current smoking is more prevalent among veterans and service members than civilians (Brown, 2010; Shahoumian, Phillips, & Backus, 2016). Although VHA has made progress in reducing the rate of current smoking among its patients, in 2014 19.0% of VHA patients reported current every day smoking compared to 16.8% of the U.S. population (Jamal et al., 2015; U.S. Department of Veterans Affairs, 2014a). Diseases caused by tobacco use are a significant burden, with an estimated \$2.7 billion of VHA health care expenditures in 2010 attributable to smoking (Barnett,

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Hamlett-Berry, Sung, & Max, 2015). Because VHA serves a large and geographically diverse population—36% of all enrolled veterans are rural (U.S. Department of Veterans Affairs, 2014b)—timely access to health care is a priority for VHA. As such, VHA has invested in telehealth, mobile, and web resources to provide patients with remote access to care.

Mobile health (mHealth) interventions offer an opportunity to extend the reach of tobacco cessation interventions outside of traditional health care settings *via* a device that most adults already own, is generally always on, and is already used many times each day. Cell phone and text message use are commonplace in the U.S. with 91% of adults reporting cell phone ownership and 81% using their cell phone to send or receive text messages (Duggan, 2013). Likewise, a VHA patient sample surveyed found that 83% owned a cell phone (Houston et al., 2013). Text messaging programs have demonstrated efficacy in improving tobacco abstinence rates. Randomized trials of the Text2Quit and Stop My Smoking USA programs in the U.S., the txt2stop program in the U.K., and a text messaging program in New Zealand each reported over a two-fold increase in abstinence rates in the intervention group compared to the control (Abroms, Boal, Simmens, Mendel, & Windsor, 2014; Free et al., 2011; Rodgers et al., 2005; Ybarra, Holtrop, Prescott, Rahbar, & Strong, 2013). Meta-analyses report slightly lower, although still significant, odds of abstinence with a text messaging program, overall indicating that text messaging programs are likely more effective than minimal or no intervention (Head, Noar, Iannarino, & Grant Harrington, 2013; Spohr et al., 2015; Whittaker et al., 2012). Despite the efficacy of text messaging programs in clinical trials, it is important to also evaluate the effectiveness of the programs in real world settings to inform the translation of research into clinical practice (Glasgow, Klesges, Dziewaltowski, Bull, & Estabrooks, 2004).

To increase veteran access to tobacco cessation treatment, VHA partnered with the National Cancer Institute (NCI) to establish SmokefreeVET, a text messaging program for veterans in care in VHA. SmokefreeVET was based on the NCI text messaging program, SmokefreeTXT, an automated intervention that provides text messages with encouragement, advice, and tips to help smokers quit and stay quit. Little is known about real world text messaging program users, particularly veteran users of such programs. We were interested in understanding how users engage with the SmokefreeVET program and in characterizing the real world users and monitoring program effectiveness. The findings are intended to provide information to improve text messaging programs for clinical use as well as to inform future VHA smoking cessation programs and clinical initiatives.

2. Methods

2.1. SmokefreeVET program description and development

SmokefreeVET is a tobacco cessation program for veterans delivered entirely by text message. The intervention is based on a pre-programmed library of messages that are delivered daily and scheduled according to quit date. Users enroll online or by text message and provide demographic information, smoking frequency, and number of cigarettes smoked per day. Each user is required to set a quit date in order to receive text messages. Users can enroll at any point in their quit attempt and received messages accordingly. Between two and five messages are sent daily over the 8-week duration of the program, beginning 2 weeks prior to the user's quit date and continuing for 6 weeks afterwards. Messages contain tips and encouragement to quit smoking and assessment questions to evaluate users' cravings, mood, and abstinence. Daily messages end 42 days after the quit date, and three additional abstinence assessment questions are asked at 1, 3, and 6 months post-quit date. Thirty-one out of 143 total messages in the SmokefreeVET library are assessment questions, only two of which are asked in the 2 weeks of messages prior to the user's quit date. SmokefreeVET was adapted from NCI's SmokefreeTXT program by adding messages encouraging use of

smoking cessation medications and referring users to other VHA resources, such as the VHA smoking quitline and their VHA health care provider. Follow-up assessment questions on the use of medications were also added to the SmokefreeVET library. VHA clinicians were consulted on content and word choice, and veteran patient input on program format and content was obtained through interviews.

In addition to the pre-programmed library, keywords (URGE, STRESS, SMOKED) provide on-demand tips for coping with a craving, stress, or a lapse. URGE and SMOKED messages were adapted from the SmokefreeTXT keywords CRAVE and SLIP, respectively. STRESS was adapted from SmokefreeTXT keyword MOOD by adding messages to address smoking triggers identified in Iraq- and Afghanistan-era veterans (Gierisch et al., 2012). The keyword messages in general were modified to be veteran-specific in terms of word choice and to refer users to other VHA resources. CRISIS was an additional keyword added to SmokefreeVET to direct users to the Veterans Crisis Line (Christofferson, Hamlett-Berry, & Augustson, 2015). There are 13 messages throughout the library that contain prompts to use one or more of the keywords associated with the program.

2.2. Sample and procedure

The initial sample included 2188 SmokefreeVET users who enrolled in the program between 12:00 am May 30, 2013 and 12:00 am May 1, 2014. SmokefreeVET was widely disseminated through the VA health care system beginning in May 2013, and users may have been referred to the program by their health care provider or learned about it through VA websites or social media platforms. Users were excluded if they did not receive the intervention, specifically if they enrolled with a device that could not receive text messages ($n = 55$), never sent a text to the program ($n = 166$), did not set a quit date ($n = 281$), set a quit date more than two weeks after May 1, 2014 ($n = 1$), opted out of the program before reaching their quit date ($n = 204$), or were located outside of VHA's network area ($n = 11$). The final sample contained 1470 users.

All data was obtained from the SmokefreeVET administrative database of non-identifiable data and was provided by users upon enrollment or during the course of the program. Users who lapsed could restart the program and set a new quit date ($n = 392$). All analyses were conducted on users' most recent quit attempt as of May 1, 2014. To account for varying lengths of enrollments due to restarts, the number of days from initial enrollment until most recent quit date was co-varied throughout. Personally identifiable information was not included in the dataset. Because this analysis was designed for internal VA purposes to evaluate and improve the quality of the program, IRB approval was not required as outlined in the VHA Handbook 1058.05.

2.3. Statistical analysis

User engagement was measured by tallying the total number of text messages (prompted, unprompted, and keywords) sent each week by each user to the SmokefreeVET program during the 6 weeks following their quit date. Only the period following the quit date was analyzed in order to create a standard period of time for comparison of all users. In addition, 29% ($n = 431$) of users began the program on or after their quit date and did not receive any of the pre-quit messages. Users were asked an assessment question and prompted for a response by the program 9 times the first week following the quit date (week 1), 4 times each in weeks 2 and 5, and 3 times each in weeks 3, 4, and 6 in addition to receiving multiple reminders each week to use the keywords. Latent growth mixture modeling (LGMM) was employed to identify discrete classes of users based on engagement (Muthén, 2004).

Prior to LGMM, the distribution of users' weekly text counts was determined for modeling purposes. Because the weekly counts were

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