Combining Real-Time Ratings With Qualitative Interviews to Develop a Smoking Cessation Text Messaging Program for Primary Care Patients

Gina Kruse1,2,3, MD, MPH; Elyse R Park2,3,4, MPH, PhD; Naysha N Shahid1, BA; Lorien Abroms5, ScD; Jessica E Haberer1,3,6, MSc, MD; Nancy A Rigotti1,2,3, MD

1Division of General Internal Medicine, Massachusetts General Hospital, Boston, MA, United States
2Tobacco Research and Treatment Center, Massachusetts General Hospital, Boston, MA, United States
3Harvard Medical School, Boston, MA, United States
4Department of Psychiatry, Massachusetts General Hospital, Boston, MA, United States
5Department of Prevention and Community Health, Milken Institute School of Public Health, George Washington University, Washington, DC, United States
6Center for Global Health, Massachusetts General Hospital, Boston, MA, United States

Corresponding Author:
Gina Kruse, MD, MPH
Division of General Internal Medicine
Massachusetts General Hospital
100 Cambridge Street 16th Fl
Boston, MA, 02114
United States
Phone: 1 617 724 3157
Email: gkruse@mgh.harvard.edu

Abstract

Background: Text messaging (short message service, SMS) interventions show promise as a way to help cigarette smokers quit. Few studies have examined the effectiveness of text messaging (SMS) programs targeting smokers associated with primary care or hospital settings.

Objective: This study aimed to develop a text messaging (SMS) program targeting primary care smokers.

Methods: Adult smokers in primary care were recruited from February 2017 to April 2017. We sent patients 10 to 11 draft text messages (SMS) over 2 days and asked them to rate each message in real time. Patients were interviewed daily by telephone to discuss ratings, message preferences, and previous experiences with nicotine replacement therapy (NRT). Content analysis of interviews was directed by a step-wise text messaging (SMS) intervention development process and the Information-Motivation-Behavioral Skills model of medication adherence.

Results: We sent 149 text messages (SMS) to 15 patients. They replied with ratings for 93% (139/149) of the messages: 134 (96%, 134/139) were rated as clear or useful and 5 (4%, 5/139) as unclear or not useful. Patients’ preferences included the addition of graphics, electronic cigarette (e-cigarette) content, and use of first names. Regarding NRT, patients identified informational gaps around safety and effectiveness, preferred positively framed motivational messages, and needed behavioral skills to dose and dispose of NRT.

Conclusions: Patients recommended text message (SMS) personalization, inclusion of e-cigarette information and graphics, and identified barriers to NRT use. Combining real-time ratings with telephone interviews is a feasible method for incorporating primary care patients’ preferences into a behavioral text messaging (SMS) program.

(JMIR Mhealth Uhealth 2019;7(3):e11498) doi: 10.2196/11498

KEYWORDS
text messaging; smoking cessation; primary care
**Introduction**

**Background**

There is growing evidence that smoking cessation interventions delivered by mobile phone are effective at helping smokers quit [1]. Smartphone apps have been developed for smokers that deliver evidence-based behavioral advice, acceptance and commitment therapy, mindfulness training, digital photo aging, contextually tailored messages using geoposition and social context, medication adherence support, and positive psychology interventions to name just a few [2-10]. However, so far, no smartphone apps have demonstrated improved long-term cessation outcomes at 6 months or longer.

In contrast, short message service (SMS) text messaging interventions have demonstrated improved long-term cessation among cigarette smokers [1,11-13]. SMS text messaging programs for smokers deliver behavioral advice on the basis of several behavior change theories [14] to increase self-efficacy [15]. Further, they have been shown to improve quit chances by 30% to 70% compared with self-help material or usual care [1,11-13]. Most of the previous mobile health interventions for smokers, both SMS text messaging– and smartphone-delivered interventions, have examined community-based samples recruited from schools or internet advertisements [16-21].

Mobile health interventions for smokers have not been well studied in health care settings. Studies examining mobile apps for smokers in health care settings have not tested long-term outcomes [10,22-24]. Studies of SMS text messaging in health care settings have measured long-term abstinence but have found mixed results. There were 2 studies that examined smoking outcomes among patients and offered varenicline or varenicline plus SMS text messaging and found no effect from adding SMS text messaging [25,26]. Another study found no effect of SMS text messaging for hospitalized smokers [27]. Furthermore, 1 study found no significant effect of SMS text messaging for pregnant smokers [28]. In contrast, 2 primary care–based studies and 1 study among cardiac rehabilitation patients examined SMS text messaging versus usual care or a brief behavioral intervention and found improved smoking outcomes [29,30]. These mixed results highlight the need to better understand how to integrate SMS text messaging in health care settings with other smoking cessation treatments.

All these previous studies targeted motivated or treatment-seeking smokers, yet 80% to 90% of smokers did not meet these criteria [31]. Interventions that actively seek smokers could have a much wider population impact [32]. We have previously examined the feasibility of proactively offering an SMS text messaging intervention to smokers identified from the electronic health record (EHR) of 2 primary care practices [33]. In that study, 10% of the patients including both motivated and unmotivated smokers accepted an SMS text messaging intervention tailored to readiness to quit from their health care system.

Primary care is an important site for delivering tobacco cessation interventions with 84% of US smokers being screened for tobacco use by a physician each year [34]. Receiving digital messages from a trusted source, such as a local health care system [35], may boost their behavioral impact. We also do not know how patients’ expectations for communications from their health care provider affects their preferences for SMS text message content or what literacy level is appropriate for SMS text messages targeting patients.

Integrating SMS text messaging programs within primary care also presents an opportunity to support other treatments including pharmacotherapy. Adherence to smoking cessation medications is suboptimal with nicotine replacement therapy (NRT) users continuing treatment for less than half the recommended duration [36-40]. SMS text messaging programs have been used to improve medication adherence in chronic conditions including HIV, diabetes, and schizophrenia [41-44], but there is only 1 previous study examining an SMS text messaging intervention addressing medication adherence among smokers [25]. In that study, SMS text messages promoting varenicline use among people with HIV did not increase adherence, but abstinence was higher at 8 weeks among patients receiving SMS text messages plus telephone counseling compared with standard care [25].

There are few published studies describing the development and adaptation of smoking cessation mobile health interventions for health care settings [4,22,45-47]. To our knowledge, none have included both behavioral advice and content encouraging NRT adherence for primary care patients. In this paper, we present a step-wise process for message development. Our process followed other published processes for SMS text message intervention design with the unique aspect of combining real-time ratings of messages with daily qualitative interviews with target users [48-50]. This use of real-time ratings is similar to previous work combining behavioral smoking data from ecological momentary assessments with qualitative data to understand substance use behaviors [51].

**Objectives**

We aimed to gather insights into primary care patients’ reactions to messages in the context of their daily lives and to understand their experiences with and barriers to using NRT. Specifically, we examined 3 SMS text messaging intervention components: (1) new content for smokers not ready to quit, comprising motivational advice and encouragement to practice quitting, (2) new content promoting NRT use, and (3) content included in an existing national SMS text messaging campaign. The national campaign content is SmokefreeTXT. This content was developed for the US public [14] and was not targeted to patients in primary care settings who may have different expectations for content coming from their health care provider and access to different resources in the primary care context. Our objective was to develop an SMS text messaging program tailored to the needs of smokers in primary care by adapting established SMS text message content and developing new theory-based medication messages, incorporating patients’ preferences for communication from their health care provider, and preferences for language around smoking cessation. Patient interviews and SMS text message assessments were designed to improve our understanding of patient preferences for SMS text messaging and experiences using NRT. These results inform the adaptation
of SMS text messages offering behavioral advice to smokers during a quit attempt and the development of novel motivational and medication-focused messages targeting smokers in primary care.

**Methods**

Our overall step-wise approach to SMS text messaging intervention development for primary care patients who smoke is shown in Figure 1.

In Step 1, we compiled a preliminary set of programmatic messages for primary care patients who smoke from established sources [33,52]. In Step 2, we asked a sample of primary care patients to rate messages in real time. We measured the time to respond to the rating message to understand when patients were reading and responding to messages. The ratings also measured usefulness or clarity of draft content. We also measured URL links clicked as proportion of URL links clicked out of all URL links sent to a patient to understand engagement with the program and accessibility of Web-based content. The patients simultaneously participated in daily qualitative telephone interviews to explain their ratings, their use of Web-based content, and their preferences for smoking cessation SMS text messaging content. In Step 3, the findings were used to design a set of modifications to the preliminary message set.

**Participants**

From February 2017 through April 2017, we recruited smokers from 2 Boston-area community health centers affiliated with a large academic medical center. We recruited patients who participated in a previous feasibility study of SMS text messaging for smokers in primary care [33]. These patients were approved by their primary care providers to be contacted about SMS text messaging research studies for smokers so that we were not required to seek additional provider approval before contacting them. Eligibility criteria included the following: aged 18 years or older, current or former smoker, able to speak and read English, visited their primary care physician in the last 2 years, had a mobile number in their electronic health record, not pregnant, and able to provide informed consent.

**Ethics**

The project was approved by the Partners Healthcare Institutional Review Board. Participants provided verbal informed consent to participate and received a US $40 gift card.
Preliminary Text Messaging Set

A preliminary set of “programmatic messages” comprised messages from 3 sources: (1) the National Cancer Institute’s SmokefreeTXT [52], (2) the novel content we developed for smokers not ready to quit [33], and (3) the novel messages promoting use of NRT based on the Information-Motivation-Behavioral Skills (IMB) model of adherence [53].

SmokefreeTXT

Messages from a 2013 version of SmokefreeTXT were used [52]. SmokefreeTXT targets smokers who are ready to quit in the next 30 days. The program invites users to enter a quit date in the next 30 days and sends messages to support them through the quit attempt by addressing motivation, self-regulatory capacity, and other behavioral skills [14]. It includes periodic assessments that query smoking status and other self-reported outcomes and offers real-time support through keywords, which the users can type and send to request specific help with cravings, mood symptoms, or if they slip and have a cigarette.

Content for Smokers Not Ready to Quit

The content for smokers not ready to quit included motivational and quit induction messages developed for our previous pilot study that aimed to test the feasibility of sending proactive SMS text messages to smokers in primary care [33]. Motivational messages encouraged users to identify personal reasons for change and internal motivations to quit [54,55]. Quit induction messages are used on smokefree.gov and have been studied in randomized trials [52,56]. These messages encourage smokers to try a practice quit attempt (PQA) explained as an attempt to not smoke for hours or days without commitment to increase motivation and self-efficacy [57].

Smoking Cessation Medication Adherence Content

Medication-promoting messages were based on the IMB model of medication adherence [53]. This novel content was not included in the previous feasibility study. In the IMB model, information relevant to medication adherence may be accurate or inaccurate and facilitate or hinder adherence and may include how to take medications, medication effectiveness, drug interactions, or side effects. Motivation to adhere to medications encompasses both personal and social motivations and may include the individual’s attitudes toward adherence, beliefs about the effects of adherence, perceived social support to adhere to medication, and interest in complying with the wishes of others. Behavioral skills include the self-efficacy and actual abilities to take medications including acquiring and using medication, dealing with adverse effects, communicating with health care providers, and calling up social support. Preliminary medication-promoting messages included informational messages about the mechanism of action and effectiveness of NRT, motivational reminders highlighting social factors, and behavioral tips about how to use NRT ad lib or after a slip.

Phase 1: Real-Time Message Ratings

From our programmatic message set, we purposively selected subsets of messages with potential challenges for users. First, we selected messages with a high literacy level based on a Flesch-Kincaid score greater than eighth-grade level. Second, we selected messages with URLs. Third, we selected messages describing the PQA and novel medication adherence messages. Using an internet-based mobile messaging platform (Upland Mobile Messaging, Austin, TX), we created 4 sets of 10 to 11 messages scheduled for delivery over a 2-day span between the hours of 9:00 am and 5:00 pm. Each programmatic message was followed by a rating message that asked the participant to rate the message’s usefulness or clarity depending on the message content. Each participant was assigned to receive 1 of the 4 sets of programmatic messages and ratings. Assignment to message subsets was sequential, with each message set being rated by 3 to 4 participants.

Quantitative Analysis

We compared the characteristics of the participants in this study with those who were unreachable or declined participation using Chi-square and student’s t tests. We calculated the proportion of messages rated as clear or useful, the proportion of URL links clicked, and the median and distribution of response times to ratings. Analyses were conducted in Stata version 13 (StataCorp).

Phase 2: Semistructured Interviews

Each day of messages was accompanied by a qualitative telephone interview. Interviews were conducted by a clinical research coordinator (NS) and a physician-researcher (GK) with qualitative interview experience. Interview topics included structured data on participants’ smoking status, readiness to quit, and use of NRT; they also included open-ended inductive inquiries exploring the day’s real-time message ratings and message content, a priori inquiries about preferences for message timing and frequency, personalization, privacy concerns, previous experiences with cessation medications, and a priori inquiries asking about preferences among sample message types (eg, preference for informational or motivational medication messages, spiritual content, inspirational stories, or games). Interviews were audio recorded and transcribed for content analysis. After every 3 to 4 patients, we iteratively reviewed the transcripts to assess for new content. We stopped recruitment when saturation was reached, defined as the point at which we heard no more new topics or ideas in response to interview questions [58].

Qualitative Analysis

Qualitative interview transcripts were content analyzed using NVivo version 11 (QSR International) by 2 coders (GK and NS). The unit of analysis was the patient. Coders first read the transcripts and identified the key concepts. These key concepts were used to develop a preliminary coding framework. Furthermore, the coders reviewed each transcript using the preliminary framework to refine a priori themes and add emergent themes [59]. Coding was at the sentence level. All content was analyzed and could be coded with multiple themes. After iteratively analyzing all transcripts and reconciling discrepancies, the final coding structure was reviewed with a third researcher (EP). All interviews were double coded with the final coding structure that included 4 domains, 17 major themes, and 4 subthemes. We used kappa statistics to measure intercoder agreement with the final coding structure. The overall
kappa, calculated by averaging across all themes and weighting patients equally, was 80% (individual kappa scores are indicated in Multimedia Appendix 1).

Phase 3: Modifications to Text Messaging Intervention

In the final phase of this message development process, the qualitative interview findings and ratings informed changes to the SMS text messaging program. To define the message modifications, the study team reviewed the final qualitative themes and, through in-person and written discussion, came to a consensus on the planned message changes.

Results

Study Sample

Of 76 participants in the previous feasibility study, 57 (75%, 57/76) were reached and 15 (20%, 15/76) enrolled in this study. Characteristics of the 15 participants are shown in Table 1. Compared with patients who did not participate, participants who enrolled in this study were more often non-Hispanic white (P = .04). In all, 9 participants (60%, 9/15) were daily smokers, 4 (26.7%, 4/15) less-than-daily smokers, and 2 (13.3%, 2/15) former smokers who quit after the previous pilot study. A total of 10 (66.7%, 10/15) reported using NRT in a previous quit attempt.

Phase 1: Real-Time Message Ratings

We sent 149 programmatic messages and 149 rating messages. Of the 24 unique messages with URL links, none were clicked. Participants replied with ratings for 93.2% (139/149) of messages sent. The median time from rating message to reply was 7.0 min (interquartile range 1.0-29.0; Multimedia Appendix 2). Each message was rated by 3.6 participants on average with 1 message receiving only 2 ratings. The 10 missing ratings came from 5 participants. Of the 139 ratings, 96.4% (134/139) rated messages as useful or clear. Messages rated as unclear or not useful included 2 messages describing PQAs, 1 informational message about NRT, 1 motivational message, and 1 high literacy-level message (Multimedia Appendix 3).

Phase 2: Semistructured Interviews

All 15 participants completed the first qualitative interview, 87% (13/15) completed the second and 2 people were unreachable for the interview despite completing the message ratings. Our interviews produced 17 themes and 4 subthemes across 4 domains (Multimedia Appendix 1).

Program Framework

Message Frequency and Timing

Participants recommended from 1 to 5 messages per day and some recommended sending messages before bed, in the evening. When asked whether sample messages would be more effective if sent at other times, all participants thought the message’s effectiveness would not be altered if received at a different time. When asked separately about URL links, some participants reported being at work as a reason for not clicking at the time of receipt.

Personalization

Most participants liked personalization with their first name and described it as humanizing and comforting. However, several participants had concerns about other types of personalization such as including their doctor’s name:

[Use of first names] makes it sound like it’s not coming from a robot caller. [Daily smoker, female]

Yeah, I think [Using your doctor’s name] would feel invasive like, “Whoa, they-- what else do they know about me?” [Former smoker, male]

Table 1. Characteristics of participants.

| Demographic characteristics | Participants (N=15) | Declined or unreachable (N=61) | P valuea |
|-----------------------------|--------------------|-------------------------------|----------|
| Age (years), mean (range)   | 46 (28-61)         | 52 (23-70)                    | .10      |
| Female, n (%)               | 6 (40)             | 41 (67)                       | .08      |
| Race and ethnicity, n (%)   |                    |                               | .04      |
| White                       | 12 (80)            | 58 (95)                       |          |
| African American            | 1 (7)              | 2 (3)                         |          |
| Latino                      | 2 (13)             | 0 (0)                         |          |
| Other                       | 0 (0)              | 1 (2)                         |          |
| Medical comorbiditiesb      | 5 (33)             | 19 (31)                       | > .99    |
| Insurance status, n (%)     |                    |                               | .51      |
| Medicare                    | 4 (27)             | 9 (15)                        |          |
| Medicaid                    | 4 (27)             | 12 (20)                       |          |
| Commercial payer            | 7 (47)             | 39 (64)                       |          |
| Self-pay                    | 0 (0)              | 1 (2)                         |          |

aOn the basis of student t test or Fisher exact test.
bIncludes diabetes, hypertension, and coronary artery disease.
Privacy Concerns
Participants reported no issues with privacy of the messages they received. They also reported no concerns for privacy with an SMS text messaging program about smoking and no concerns about other people seeing their messages about smoking.

Message Content
Electronic Cigarette Content
Participants expected electronic cigarette (e-cigarette) content in messages about other tobacco products or treatments:

The one thing it doesn’t include that they may want to include is the electronic cigarettes. Because that’s what I used to help me quit and I quit for almost six months... [Daily smoker, female]

Features-Graphic Content
A few participants recommended adding emoji-style images to attract interest:

Suppose so if you have no time and you look at it and you see a picture, you’ll be more apt to look at it ... make it look fun, have some balloons or something. [Nondaily smoker, female]

Moreover, 2 participants recommended adding graphic images of lungs to enhance message effectiveness:

Nobody shows pictures of lungs...They don’t show family members sitting next to the people in bed...I think the shock value of things would really help with people too. [Former smoker, male]

Specific Facts Versus General Statements About Quitting Tobacco
Participants reported that they found specific statements of the effects of quitting to be more impactful than more general statements:

If there are more specifics on what they’re going to gain out of it and then more specifics on what they’re going to expect doing it, people more likely want to take those steps, knowing what could happen to them. [Daily smoker, female]

Encouragement and Message Framing
Participants reported that messages offering encouragement and praise would be more effective than negatively-framed messages:

Every couple days you could say, “Well if you didn’t smoke, know you can put yourself on the back.” And just kind of encourage the person and give them good feedback as to, “Good job if you didn’t smoke today.” You know give yourself a high-five. As opposed to like, “Don’t smoke, this will happen,” and “Don’t do that.” [Nondaily smoker, female]

Language Clarity
Participants did not understand some terminology in the messages including slip, lozenge, trigger, and the PQA:

Oh, those [lozenges] are the hard candy things? [Nondaily smoker, male].

Language Counseling Versus Coaching
Participants reported counseling for tobacco use had a negative connotation and made it seem more like an illness. Participants were interested in coaching:

I think coaches and-things like are better off because people think of counseling and they think like, “I have mental issue. Oh, I have a drug problem,” or-- “people don’t think of cigarettes as heroin or opiates or something like that.” [Former smoker, male]

URL Links
Participants reported not clicking URL links as they did not have time, were not looking for or needing the information offered, were at work, had no internet access, or lacked computer skills. Participants recommended use of a visual link rather than a URL to increase the appeal. Participants also made suggestions for how to improve messages with URL links such as offering a telephone number for local smoking-cessation programs to learn about available treatment and services in addition to a link to the local program website for those without internet access:

Maybe you could leave a phone number too, something like that...because like I said, I don’t have all them fancy phones that can go on the computer. [Nondaily smoker, male]

Features Games for Distraction
Participants were asked a priori questions about preferences for message content from a list of options. Nearly all participants preferred games for distraction:

Progressive things where today you do this, and then tomorrow, you’re going to add to your score for this. And then it leads up to you get a silver cup, and then next week, you go for a gold cup...You know how games grab you and bring you in. [Former smoker, male]

Barriers to Nicotine Replacement Therapy Use
Cost
Participants identified several barriers to starting or continuing NRT use including cost, side effects and safety, effectiveness, forgetting, and difficulties or dislikes. Cost was a commonly-cited barrier to using NRT and something participants wanted to receive information about, by SMS text message:

I don’t know if they give them free in places. So maybe more information on how you can get them if you don’t have money. Because they are pretty pricey. [Nondaily smoker, female]

Side Effects and Safety
Concerns about NRT side effects and safety included cancer-risk beliefs, risks of smoking when using NRT, and potential for addiction to NRT. These concerns were a source of stress:
I was just like, “Oh my God. If I do smoke with this on, I’m going to like, blow up or something.” So, I just felt like there was a lot of pressure. So, I wanted to smoke more. [Nondaily smoker, female]

All these things to help you quit smoking, it’s still nicotine going into your body. Can’t that still cause you to get cancer? [Nondaily smoker, female]

**Perceived Effectiveness**

Some participants reported NRT was ineffective in their previous attempts, and this was a barrier to subsequent use:

[The patches] they’re not really great for-- if you smoke a lot and you’ve been smoking a long time, the patches don’t help all that much. [Daily smoker, male]

**Difficulties and Dislikes**

Participants described disliking the taste of lozenges and the difficult process of patch disposal:

I mean it’s not a real pain in the neck, but they talk about it [the patch] like you got to get rid of it like it’s a contaminant. Like it’s medical waste or something. [Nondaily smoker, male]

**Forgetting**

Few participants reported forgetting medications and some reported feeling aware of having the patch on:

I’m pretty much like “oh my gosh it’s on me.” [Nondaily smoker, female]

**Facilitators of Nicotine Replacement Therapy Use**

**Information**

Queries about facilitators of medication use were organized around information, motivation, and behavioral skills constructs. People identified informational needs about side effects, safety, and dosing of medications and recommended providing this in simple, short formats:

Maybe, I don’t understand how they say if you smoke less than ten cigarettes a day, start on a number two patch. If they explain that a little more. [Nondaily smoker, male]

**Motivation**

When asked *a priori* questions about their preferences for informational, motivational, or behavioral skills medication messages, participants who preferred motivational messages described them as caring and conversational:

It’s more personal, I don’t know. More like let’s get to it, it just seemed to me more normal. [Daily smoker, female]

**Behavioral Skills**

Participants who liked the behavioral skills messages described them as straightforward and useful. Participants identified needed skills to take NRT such as how to manage slips, *ad lib* use, side effects, and getting refills:

In order not to slip up, take a couple of more-- of the lozenge or the patch. You know what I mean? [Nondaily smoker, male]

When asked about tips or skills for remembering to take medications, participants thought reminders by SMS text message could be helpful:

Well, probably if I got a reminder on my phone, a text message or something. [Daily smoker, female]

**Phase 3: Modifications to Text Messaging Intervention**

On the basis of the interview findings, we modified the existing messages including delivery timing, message text, and pictorial content and added new medication-focused messages for a final program of 244 scheduled messages. We adjusted message timing to add evening messages on some days for a total of 3 to 5 messages per day. Sample messages that were modified or developed based on qualitative data are shown in Table 2. In addition to these changes, we tried to leverage the users’ relationship with their health care system by referencing local tobacco-cessation resources. Given the preferences for normal or conversational messages, we added a feature to respond with, “You are welcome” whenever someone texts “Thank you.”
| Theme                                      | Modification                                                                 | Example                                                                 |
|-------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| **Program framework and content**         |                                                                              |                                                                         |
| Personalization                          | We personalized 17 messages to the user’s first name. Other types of personalization were not used, such as referencing the user’s primary care provider. | You are getting closer to the big day [first_name]. It may help to cut back on the number of cigarettes you smoke. Give it a try. |
| Electronic cigarette (e-cigarette) content | We added messages that acknowledged that people are using electronic nicotine delivery systems. | Using e-cigs or vaping? We don't know if these help people quit cigarettes. Keep your smokefree goal in mind—to quit cigarettes completely. |
| Graphic content                          | We added emoji icons to 7 messages. We added links to personal stories from the Center for Disease Control’s “Tips from former smokers” public health campaign and links to the World Health Organization's library of graphic warning labels. | Wow, 3 weeks smokefree. [balloon emoji] Give yourself a pat on the back! Just don’t light up to celebrate; that is a slippery slope. |
| Specific facts versus general statements   | We added messages with facts about the effects of quitting smoking.          | Quitting smoking improves your health immediately, it lowers your blood pressure in the first 20 minutes. |
| Encouragement and framing of messages     | We used participants’ own language to replace negatively-framed messages with encouraging messages. | Wow, 2 weeks smokefree! Ask the person next to you for a high five! You did well! You deserve it. |
| Language clarity                          | We added definitions of triggers, lozenges, and slips and modified our description of the practice quit attempt. | You might slip by having a puff or even 1 or 2 cigarettes after you quit. Don't let 1 slip be an excuse to start smoking again. Learn from the situation ASAP and move on. |
| Language counseling versus coaching       | We edited all messages to use the words “coach” or “coaching” instead of “counseling.” | Quit-Tobacco coaches & medication can increase your chances of quitting. Free 1-on-1 coaching is available at MGH Community Health Centers. Call XXX-XXX-XXXX for more info. |
| Features: URL links                       | We modified the link content to reflect requested information such as information about e-cigarettes or patch dosing. We added telephone numbers together with URL links to additional tobacco treatment resources. | Using e-cigs or vaping? We don't yet know if vaping is safe or if it helps to quit smoking. Nicotine patches are safe & effective. Learn more: URL. |
| Features: games for distraction           | We created a trivia game prompted by a keyword TRIVIA. | Distract yourself with trivia for a few minutes. When did MGH open its doors? Text A for 1801, B for 1821 or C for 1905; <B response> That's right! [gold cup emoji] MGH opened in 1821. It is the 3rd oldest general hospital in the US. |
| **Medication information, motivation, and behavioral skills** |                                                                              |                                                                         |
| Information: dosing                       | We added messages with simple dosing instructions.                          | Patch users, if you smoke 10 or more cigs per day start with step 1. If you smoke less than 10 cigs start with step 2: URL. |
| Information: safety and side effects      | We added messages with information about the maximum daily dose to reassure participants concerned about overuse and describing the low risk of addiction to nicotine medications. We also added messages with advice for dealing with common side effects of skin irritation or sleep disturbance. | The nicotine patch and lozenge have less nicotine than cigarettes. You are not likely to become addicted to the patch or lozenges. |
| Information: medication effectiveness     | We added messages encouraging users to consider combination therapy in consultation with their doctor to address concerns of ineffectiveness and advice on correct medication use to maximize effectiveness. | Consider using the patch and gum or lozenge together if you’ve been unable to quit with medication in the past. Ask your doctor for advice. |
| Motivation: forgetting                    | We added weekly reminder messages offering conversational encouragement and asking users if they used medications that day. | We hope you are doing well. Did you use your nicotine patch or lozenge today? Reply with USED or NOT USED. |
**Discussion**

This study aimed to develop an SMS text messaging program tailored to readiness to quit using preferences of primary care patients who smoke cigarettes and to explore patients’ previous experiences with NRT with the purpose of developing messages promoting NRT use.

**Principal Findings**

By combining real-time message ratings with daily interviews, we identified SMS text message modifications including preferences for the inclusion of graphics, expectations around e-cigarette content, preferences for the inclusion of personalization by user’s name, and recommendations to make URL links more impactful by using pictures or adding telephone numbers for those without internet access. Real-time ratings provided feedback, in most cases, within 30 min of receiving the message. We also identified preferences for message style such as a conversational tone and use of emoji graphics. Participants described barriers to taking smoking-cessation medications including costs, side effects and safety concerns, and perceived effectiveness.

**Comparison With Previous Work**

Many previous mobile health apps and SMS text messaging interventions used focus groups, interviews with individuals in the target population, or professional input to develop message content [4,46,47,49,50,60]. Our work used a hybrid approach on the basis of recommended steps for SMS text messaging program development [61]. Few previous studies have combined real-time assessments of SMS text messages with daily interviews [60]. Our interviews provided insight about what patients were doing when they received messages and their reaction in that setting. Although we used this real-time rating for intervention development, it has also been used within interventions through machine-learning and 5-item real-time user ratings to select messages that influence smoking cessation behaviors [62].

In this study, when presented with different options for personalizing messages, participants liked personalizing SMS text messages with their first names, but the use of the physician’s name was viewed as intrusive by some. Previous work examining preferences for SMS text messages about health topics has produced conflicting results, with some participants expressing concerns about privacy of message content about health screening tests, whereas others expressed no concern despite the inclusion of sensitive material such as HIV status [63,64]. We tried to balance privacy concerns by using first names but excluding personal information described as intrusive. For example, instead of referencing the individual physician, we included the name of the local health care system [65].

Previous work has explored the effectiveness of graphic images or emoticons in nutrition campaigns [66,67]. Previous work has also shown that individuals communicate about tobacco products via social media using emoticons or images [68]. To our knowledge, this is the first study describing user preferences for graphic images or emoticons in an SMS text messaging program for smokers. It is possible that proactively sending SMS text messages with a link to graphic images may confer some of the benefits graphic warning labels confer on smoking cessation [69].

**Limitations**

Our sample recruited participants from an earlier SMS text messaging feasibility study. All of them had previously seen a smoking cessation SMS text messaging program; this experience may have introduced bias. Several were former smokers. We tested only a subset of messages over 2 days and did not gather participants’ reactions to the entire SMS text messaging program. We used a 2-item rating scale for simplicity and with this scale, most of the messages were rated positively. Use of a nonbinary rating instrument, changing the rating system to reflect the targeted behavioral constructs such as self-efficacy, or rating usability [50] may produce greater insight into message preferences and impact.

**Conclusions**

This message development method of combining message ratings with daily telephone interviews is novel and was feasible among a sample of smokers in primary care. This method produced insights and modifications to the SMS text messaging intervention, including edits to the message style such as addition of graphics, conversational tone, editing of URL links, and clarifying the language. User-reported barriers and facilitators of NRT use were used to generate informational messages about medication safety, use and effectiveness, motivational messages in a conversational style, and messages describing behavioral skills such as dealing with slips when on NRT.
Combining real-time SMS text message ratings with qualitative data was feasible among primary care patients who smoke, directed modifications to SMS text message content to better tailor it to primary care patient preferences, and was used to produce novel medication-adherence messages. The final SMS text messaging program is being tested in a pilot randomized trial of SMS text messaging and mailed NRT among primary care patients who smoke (NCT03174158).

Acknowledgments
This study was funded by National Institute on Drug Abuse 5K23DA038717 and the Massachusetts General Hospital Executive Committee on Research Claflin Distinguished Scholar Award. JEH is supported by K24MH114732. The funding sources had no involvement in the design of the study, collection, analysis, interpretation of data, or writing of the manuscript or decision to submit.

Conflicts of Interest
GK has a family financial interest in Dimagi, Inc, and is a paid consultant for Click Therapeutics, Inc. NAR has consulted without pay for Pfizer, is a paid consultant for Achieve Life Sciences, and received royalties from UpToDate for chapters on smoking cessation. ERP received royalties from UpToDate for chapters on smoking cessation. JEH has been a paid consultant for Merck and Natera. LA has stock in Welltok, Inc, and receives royalties from the licensing of Text2Quit to Welltok, Inc.

Multimedia Appendix 1
Qualitative themes and kappa statistics.

[DOCX File, 14KB-Multimedia Appendix 1]

Multimedia Appendix 2
Distribution of response time to message rating queries.

[PNG File, 65KB-Multimedia Appendix 2]

Multimedia Appendix 3
Rating message responses (N=149).

[DOCX File, 12KB-Multimedia Appendix 3]

References
1. Whittaker R, McRobbie H, Bullen C, Rodgers A, Gu Y. Mobile phone-based interventions for smoking cessation. Cochrane Database Syst Rev 2016;4:CD006611. [doi: 10.1002/14651858.CD006611.pub4] [Medline: 27060875]
2. Garrison KA, Pal P, O'Malley SS, Pittman BP, Gueorguieva R, Rojiani R, et al. Craving to quit: a randomized controlled trial of smartphone app-based mindfulness training for smoking cessation. Nicotine Tob Res 2018 Jun 18. [doi: 10.1093/ntr/nty126] [Medline: 29917096]
3. Brinker TJ, Enk A, Gatzka M, Nakamura Y, Sondermann W, Omlor AJ, et al. A dermatologist's ammunition in the war against smoking: a photoaging app. J Med Internet Res 2017 Sep 21;19(9):e326 [FREE Full text] [doi: 10.2196/jmir.8743] [Medline: 28935619]
4. Baskerville NB, Struik LL, Dash D. Crush the crave: development and formative evaluation of a smartphone app for smoking cessation. JMIR Mhealth Uhealth 2018 Mar 2;6(3):e52 [FREE Full text] [doi: 10.2196/mhealth.9011] [Medline: 29500157]
5. Bricker JB, Copeland W, Mull KE, Zeng EY, Watson NL, Akioka KJ, et al. Single-arm trial of the second version of an acceptanč & commitment therapy smartphone application for smoking cessation. Drug Alcohol Depend 2016 Nov 4;170:37-42. [doi: 10.1016/j.drugalcdep.2016.10.029] [Medline: 27870987]
6. Hoeppner BB, Hoeppner SS, Kelly L, Schick M, Kelly JF. Smiling instead of smoking: development of a positive psychology smoking cessation smartphone app for non-daily smokers. Int J Behav Med 2017 Oct;24(5):683-693. [doi: 10.1007/s12529-017-9640-9] [Medline: 28197846]
7. Naughton F, Hopewell S, Lathia N, Schalbroeck R, Brown C, Mascolo C, et al. A context-sensing mobile phone app (Q Sense) for smoking cessation: a mixed-methods study. JMIR Mhealth Uhealth 2016 Sep 16;4(3):e106 [FREE Full text] [doi: 10.2196/mhealth.5787] [Medline: 27637405]
8. Bruno M, Wright M, Baker CL, Emir B, Carda E, Clausen M, et al. Mobile app usage patterns of patients prescribed a smoking cessation medicine: prospective observational study. JMIR Mhealth Uhealth 2018 Apr 17;6(4):e97 [FREE Full text] [doi: 10.2196/mhealth.9115] [Medline: 29666043]
9. Iacoviello BM, Steinerman JR, Klein DB, Silver TL, Berger AG, Luo SX, et al. Clickotine, a personalized smartphone app for smoking cessation: initial evaluation. JMIR Mhealth Uhealth 2017 Apr 25;5(4):e56 [FREE Full text] [doi: 10.2196/mhealth.7226] [Medline: 28424253]

10. Businelle MS, Ma P, Kendzor DE, Frank SG, Vidrine DJ, Wetter DW. An ecological momentary intervention for smoking cessation: evaluation of feasibility and effectiveness. J Med Internet Res 2016 Dec 12;18(12):e321 [FREE Full text] [doi: 10.2196/jmir.6058] [Medline: 27956375]

11. Head KJ, Noar SM, Iannarino NT, Grant HN. Efficacy of text messaging-based interventions for health promotion: a meta-analysis. Soc Sci Med 2013 Nov 9;77:41-48. [doi: 10.1016/j.socscimed.2013.08.003] [Medline: 24161087]

12. Spohr SA, Nandy R, Gandhiraj D, Vemulapalli A, Anne S, Walters ST. Efficacy of SMS text message interventions for smoking cessation: a meta-analysis. J Subst Abuse Treat 2015 Sep;56:1-10. [doi: 10.1016/j.jstat.2015.01.011] [Medline: 25720333]

13. Scott-Sheldon LA, Lantini R, Jennings EG, Thind H, Rosen RK, Salmoirago-Blotcher E, et al. Text messaging-based interventions for smoking cessation: a systematic review and meta-analysis. JMIR Mhealth Uhealth 2016;4(2):e49 [FREE Full text] [doi: 10.2196/mhealth.5436] [Medline: 27207211]

14. Augustson E, Cole-Lewis H, Sanders A, Schwarz M, Geng Y, Coa K, et al. Analysing user-reported data for enhancement of SmokefreeTXT: a national text message smoking cessation intervention. Tob Control 2017 Nov;26(6):683-689. [doi: 10.1136/tobaccocontrol-2016-052945] [Medline: 27852892]

15. Hoepfner BB, Hoepfner SS, Abrons LC. How do text-messaging smoking cessation interventions confer benefit? A multiple mediation analysis of Text2Quit. Addiction 2017 Apr;112(4):673-682. [doi: 10.1111/add.13685] [Medline: 27943511]

16. Haug S, Meyer C, Dymalski A, Lippke S, John U. Efficacy of a text messaging (SMS) based smoking cessation intervention for adolescents and young adults: study protocol of a cluster randomised controlled trial. BMC Public Health 2012;12:51 [FREE Full text] [doi: 10.1186/1471-2458-12-51] [Medline: 22260736]

17. Abrons LC, Boal AL, Simmens SJ, Mendel JA, Windsor RA. A randomized trial of Text2Quit: a text messaging program for smoking cessation. Am J Prev Med 2014 Sep;47(3):242-250. [doi: 10.1016/j.amepre.2014.04.010] [Medline: 24913220]

18. Free C, Knight R, Robertson S, Whittaker R, Edwards P, Zhou W, et al. Smoking cessation support delivered via mobile phone text messaging (txt2stop): a single-blind, randomised trial. Lancet 2011 Jul 2;378(9785):49-55 [FREE Full text] [doi: 10.1016/S0140-6736(11)60701-0] [Medline: 21722952]

19. Bock B, Heron K, Jennings E, Morrow K, Cobb V, Magee J, et al. A text message delivered smoking cessation intervention: the initial trial of TXT-2-Quit: randomized controlled trial. JMIR Mhealth Uhealth 2013;1(2):e17 [FREE Full text] [doi: 10.2196/mhealth.2522] [Medline: 25098502]

20. Borland R, Balmford J, Benda P. Population-level effects of automated smoking cessation help programs: a randomized controlled trial. Addiction 2013 Mar;108(3):618-628. [doi: 10.1111/j.1360-0443.2012.04091.x] [Medline: 22994457]

21. Whittaker R, Dorey E, Bramley D, Bullen C, Denny S, Elley CR, et al. A theory-based video messaging mobile phone intervention for smoking cessation: randomized controlled trial. J Med Internet Res 2011;13(1):e10 [FREE Full text] [doi: 10.2196/jmir.1553] [Medline: 21371991]

22. Brinker TJ, Brieske CM, Esser S, Klode J, Mons U, Batra A, et al. A face-aging app for smoking cessation in a waiting room setting: pilot study in an HIV outpatient clinic. J Med Internet Res 2018 Aug 15;20(8):e10976 [FREE Full text] [doi: 10.2196/10976] [Medline: 30111525]

23. Vidrine DJ, Arduino RC, Lazev AB, Gritz ER. A randomized trial of a proactive cellular telephone intervention for smokers living with HIV/AIDS. AIDS 2006 Jan 9;20(2):253-260. [doi:10.1097/01.aids.0000198094.23691.58] [Medline: 16511419]

24. Vidrine DJ, Fletcher FE, Danysh HE, Marani S, Vidrine JI, Cantor SB, et al. A randomized controlled trial to assess the efficacy of an interactive mobile messaging intervention for underserved smokers: project ACTION. BMC Public Health 2012 Aug 25;12:696. [FREE Full text] [doi: 10.1186/1471-2458-12-696] [Medline: 22920991]

25. Tseng TY, Krebs P, Schoenhaler A, Wong S, Sherman S, Gonzalez M, et al. Combining text messaging and telephone counseling to increase varenicline adherence and smoking abstinence among cigarette smokers living with HIV: a randomized controlled study. AIDS Behav 2017 Jul;21(7):1964-1974 [FREE Full text] [doi: 10.1007/s10461-016-1538-z] [Medline: 27605365]

26. Yingst JM, Veldheer S, Hrabovsky S, Hammett E, Nicholson J, Berg A, et al. Pilot randomized trial of an automated smoking cessation intervention via mobile phone text messages as an adjunct to varenicline in primary care. J Health Commun 2018;23(4):370-378. [doi:10.1080/10810730.2018.1453890] [Medline: 29578832]

27. Hammett E, Veldheer S, Hrabovsky S, Yingst J, Berg A, Poole E, et al. TXT2STAYQUIT: pilot randomized trial of brief automated smoking cessation intervention for inpatient smokers discharged from the hospital. J Hosp Med 2018 Dec 1;13(7):488-489. [doi: 10.12788/jhm.2907] [Medline: 29370320]

28. Naughton F, Cooper S, Foster K, Emery J, Leonardi-Bee J, Sutton S, et al. Large multi-centre pilot randomized controlled trial testing a low-cost, tailored, self-help smoking cessation text message intervention for pregnant smokers (MiQuit). Addiction 2017 Jul;112(7):1238-1249 [FREE Full text] [doi: 10.1111/add.13802] [Medline: 28239919]
29. Cobos-Campos R, Apiñaniz FD, Sáez DL, Parraza DN, Aizpuru BF. Effectiveness of text messaging as an adjuvant to health advice in smoking cessation programs in primary care. a randomized clinical trial. Nicotine Tob Res 2017 Aug 1;19(8):901-907. [doi: 10.1093/ntr/ntx300] [Medline: 27838659]

30. Naughton F, Jamison J, Boase S, Sloan M, Gilbert H, Prevost AT, et al. Randomized controlled trial to assess the short-term effectiveness of tailored web- and text-based facilitation of smoking cessation in primary care (iQuit in practice). Addiction 2014 Jul;109(7):1184-1193 [FREE Full text] [doi: 10.1111/add.12556] [Medline: 24661312]

31. McClure JB, Heffner J, Hohl S, Klasnja P, Catz SL. Design considerations for mHealth programs targeting smokers not yet ready to quit: results of a sequential mixed-methods study. JMIR Mhealth and Uhealth 2019 | vol. 7 | iss. 3 | e11498 | p. 12 http://mhealth.jmir.org/2019/3/e11498/

32. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. Am J Public Health 1999 Sep;89(9):1322-1327 [FREE Full text] [doi: 10.2105/ Aph.89.9.1322] [Medline: 10474547]

33. Kruse G, Kelley JH, Chase K, Rigotti NA. Feasibility of a proactive text messaging intervention for smokers in community health centers: pilot study. JMIR Formative Res 2018 May 31;2(1):e11. [doi: 10.2196/formative.9608] [Medline: 30506038]

34. Keith DR, Stanton CA, Gaalema DE, Bunn JY, Doogan NJ, Redner R, et al. Disparities in US healthcare provider screening and advice for cessation across chronic medical conditions and tobacco products. J Gen Intern Med 2017 Sep;32(9):974-980. [doi: 10.1007/s11606-017-4062-6] [Medline: 28470547]

35. Viswanath K, McCloud R, Minsky S, Puleo E, Kontos E, Bigman-Galimore C, et al. Internet use, browsing, and the urban poor: implications for cancer control. J Natl Cancer Inst Monogr 2013 Dec;2013(47):199-205 [FREE Full text] [doi: 10.1093/jncimonographs/let029] [Medline: 24395992]

36. Shiffman S, Sweeney CT, Ferguson SG, Sembower MA, Gitchell JG. Relationship between adherence to daily nicotine patch use and treatment efficacy: secondary analysis of a 10-week randomized, double-blind, placebo-controlled clinical trial simulating over-the-counter use in adult smokers. Clin Ther 2008 Oct;30(10):1852-1858. [doi: 10.1016/j.clinthera.2008.09.016] [Medline: 19014840]

37. Catz SL, Jack LM, McClure JB, Javitz HS, Deprey M, Zbikowski SM, et al. Adherence to varenicline in the COMPASS smoking cessation intervention trial. Nicotine Tob Res 2011 May;13(5):361-368 [FREE Full text] [doi: 10.1093/ntr/ntr003] [Medline: 21350041]

38. Hollands GJ, Sutton S, McDermott MS, Marteau TM, Aveyard P. Adherence to and consumption of nicotine replacement therapy and the relationship with abstinence within a smoking cessation trial in primary care. Nicotine Tob Res 2013 Sep;15(9):1537-1544 [FREE Full text] [doi: 10.1093/ntr/ntt010] [Medline: 23430709]

39. Shelley D, Tseng TY, Gonzalez M, Krebs P, Wong S, Furberg R, et al. Correlates of adherence to varenicline among HIV+ smokers. Nicotine Tob Res 2015 Aug;17(8):968-974 [FREE Full text] [doi: 10.1093/ntr/ntv068] [Medline: 26180221]

40. Burns EK, Levinson AH. Discontinuation of nicotine replacement therapy among smoking-cessation attempters. Am J Prev Med 2008 Mar;34(3):212-215. [doi: 10.1016/j.amepre.2007.11.010] [Medline: 18312809]

41. Dick J, Nundy S, Solomon MC, Bishop KN, Chin MH, Peek ME. Feasibility and usability of a text message-based program for diabetes self-management in an urban African-American population. J Diabetes Sci Technol 2011 Sep;5(5):1246-1254 [FREE Full text] [doi: 10.1177/193229681100500534] [Medline: 22027326]

42. Horvath T, Azman H, Kennedy GE, Rutherford GW. Mobile phone text messaging for promoting adherence to antiretroviral therapy in patients with HIV infection. Cochrane Database Syst Rev 2012;3:CD009756. [doi: 10.1002/14651858.CD009756] [Medline: 22419345]

43. Montes JM, Medina E, Gomez-Beneyto M, Maurino J. A short message service (SMS)-based strategy for enhancing adherence to antipsychotic medication in schizophrenia. Psychiatry Res 2012 Dec 30;200(2-3):89-95. [doi: 10.1016/j.psychres.2012.07.034] [Medline: 22901437]

44. Thakkar J, Kurup R, Laba TL, Santo K, Thiagalingam A, Rodgers A, et al. Mobile telephone text messaging for medication adherence in chronic disease: a meta-analysis. JAMA Intern Med 2016 Mar;176(3):340-349. [doi: 10.1001/jamainternmed.2015.7667] [Medline: 26831740]

45. Krebs P, Tseng TY, Pham H, Wong S, Sherman SE, Shelley D, et al. Formative evaluation of a text messaging intervention to promote varenicline adherence among tobacco-dependent persons with HIV. J Health Commun 2015;20(9):1021-1025. [doi: 10.1080/10810730.2015.1018595] [Medline: 26132516]

46. Redfern J, Thiagalingam A, Jan S, Whittaker R, Hackett ML, Mooney J, et al. Development of a set of mobile phone text messages designed for prevention of recurrent cardiovascular events. Eur J Prev Cardiol 2014 Apr;21(4):492-499. [doi: 10.1177/2047487312449416] [Medline: 22605787]

47. McClure JB, Heffner J, Hohl S, Klasnja P, Catz SL. Design considerations for mHealth programs targeting smokers not yet ready to quit: results of a sequential mixed-methods study. JMIR Mhealth and Uhealth 2017 Mar 10;5(3):e31 [FREE Full text] [doi: 10.2196/mhealth.6845] [Medline: 28283465]

48. Ybarra ML, Holtrop JS, Başçi BA, Emri S. Design considerations in developing a text messaging program aimed at smoking cessation. J Med Internet Res 2012;14(4):e103 [FREE Full text] [doi: 10.2196/jmir.2061] [Medline: 22832182]

49. Ybarra ML, Prescott TL, Espelage DL. Stepwise development a text messaging-based bullying prevention program for middle school students (BullyDown). JMIR Mhealth and Uhealth 2016 Jun 13;4(2):e60 [FREE Full text] [doi: 10.2196/mhealth.4936] [Medline: 27296471]
50. Whittaker R, Merry S, Dorey E, Maddison R. A development and evaluation process for mHealth interventions: examples from New Zealand. J Health Commun 2012;17(Suppl 1):11-21. [doi: 10.1080/10810730.2011.649103] [Medline: 22548594]

51. McQuoid J, Thrul J, Ling P. A geographically explicit ecological momentary assessment (GEMA) mixed method for understanding substance use. Soc Sci Med 2018 Apr;202:89-98. [doi: 10.1016/j.socscimed.2018.02.014] [Medline: 29518701]

52. Smokefree.gov. Resources for Health Professionals URL: https://smokefree.gov/help-others-quit [accessed 2018-11-15] [Medline: 26395100]

53. Carpenter MJ, Hughes JR, Gray KM, Wahlquist AE, Saladin ME, Alberg AJ. Nicotine therapy sampling to induce quit attempts among smokers unmotivated to quit: a randomized clinical trial. Arch Intern Med 2011 Nov 28;171(21):1901-1907. [FREE Full text] [doi: 10.1001/archinternmed.2011.492] [Medline: 22123796]

54. Jardin BF, Carpenter MJ. Predictors of quit attempts and abstinence among smokers not currently interested in quitting. Nicotine Tob Res 2012 Oct;14(10):1197-1204 [FREE Full text] [doi: 10.1093/ntr/ntr015] [Medline: 22387995]

55. Creswell JW. Qualitative Inquiry And Research Design: Choosing Among Five Approaches. Los Angeles: Sage Publications; 2013.

56. Pope C, Ziebland S, Mays N. Analysing qualitative data. In: Pope C, Mays N, editors. Qualitative Research in Health Care. Garsington Road, Oxford: Blackwell Publishing; 2006:63-81.

57. Miller WR, Rollnick S. Ten things that motivational interviewing is not. Behav Cogn Psychother 2009 Mar;37(2):129-140. [doi: 10.1017/S1352465809005128] [Medline: 19364414]

58. Sadasivam RS, Borglund EM, Adams R, Marlin BM, Houston TK. Impact of a collective intelligence tailored messaging system on smoking cessation: the Perspect randomized experiment. J Med Internet Res 2016 Nov 8;18(11):e285 [FREE Full text] [doi: 10.2196/mhealth.4917] [Medline: 26537553]

59. Carpenter MJ, Hughes JR, Gray KM, Wahlquist AE, Saladin ME, Alberg AJ. Nicotine therapy sampling to induce quit attempts among smokers unmotivated to quit: a randomized clinical trial. Arch Intern Med 2011 Nov 28;171(21):1901-1907 [FREE Full text] [doi: 10.1001/archinternmed.2011.492] [Medline: 22123796]

60. Jardin BF, Carpenter MJ. Predictors of quit attempts and abstinence among smokers not currently interested in quitting. Nicotine Tob Res 2012 Oct;14(10):1197-1204 [FREE Full text] [doi: 10.1093/ntr/ntr015] [Medline: 22387995]

61. Creswell JW. Qualitative Inquiry And Research Design: Choosing Among Five Approaches. Los Angeles: Sage Publications; 2013.

62. Pope C, Ziebland S, Mays N. Analysing qualitative data. In: Pope C, Mays N, editors. Qualitative Research in Health Care. Garsington Road, Oxford: Blackwell Publishing; 2006:63-81.

63. Miller WR, Rollnick S. Ten things that motivational interviewing is not. Behav Cogn Psychother 2009 Mar;37(2):129-140. [doi: 10.1017/S1352465809005128] [Medline: 19364414]

64. Sadasivam RS, Borglund EM, Adams R, Marlin BM, Houston TK. Impact of a collective intelligence tailored messaging system on smoking cessation: the Perspect randomized experiment. J Med Internet Res 2016 Nov 8;18(11):e285 [FREE Full text] [doi: 10.2196/mhealth.4917] [Medline: 26537553]

65. Carpenter MJ, Hughes JR, Gray KM, Wahlquist AE, Saladin ME, Alberg AJ. Nicotine therapy sampling to induce quit attempts among smokers unmotivated to quit: a randomized clinical trial. Arch Intern Med 2011 Nov 28;171(21):1901-1907 [FREE Full text] [doi: 10.1001/archinternmed.2011.492] [Medline: 22123796]

66. Jardin BF, Carpenter MJ. Predictors of quit attempts and abstinence among smokers not currently interested in quitting. Nicotine Tob Res 2012 Oct;14(10):1197-1204 [FREE Full text] [doi: 10.1093/ntr/ntr015] [Medline: 22387995]

67. Creswell JW. Qualitative Inquiry And Research Design: Choosing Among Five Approaches. Los Angeles: Sage Publications; 2013.

68. Pope C, Ziebland S, Mays N. Analysing qualitative data. In: Pope C, Mays N, editors. Qualitative Research in Health Care. Garsington Road, Oxford: Blackwell Publishing; 2006:63-81.

69. Miller WR, Rollnick S. Ten things that motivational interviewing is not. Behav Cogn Psychother 2009 Mar;37(2):129-140. [doi: 10.1017/S1352465809005128] [Medline: 19364414]

Abbriviations
- e-cigarette: electronic cigarette
- EHR: electronic health record
- IMB: Information-Motivation-Behavioral Skills
- NRT: nicotine replacement therapy
- PQA: practice quit attempt
- SMS: short message service
Combining Real-Time Ratings With Qualitative Interviews to Develop a Smoking Cessation Text Messaging Program for Primary Care Patients

URL: http://mhealth.jmir.org/2019/3/e11498/
doi: 10.2196/11498
PMID: 30912755