

Tobacco Use: Mobile Phone Text Messaging Interventions for Smoking Cessation

Community Preventive Services Task Force Finding and Rationale Statement Ratified July 2020

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CPSTF Finding and Rationale Statement

Intervention Definition

Mobile phone text messaging interventions deliver evidence-based information, strategies, and behavioral support directly to people who want to quit smoking or using tobacco. Automated text messages support participants' quit attempts and may change over the course of the intervention. Messages may be one or more of the following:

- Tailored for individuals based on computer algorithms that match messages to participant information
- Interactive and capable of providing on-demand text responses or behavioral support to participants encountering urges to smoke
- Developed or adapted for specific populations and communities

Mobile phone text messaging interventions may be delivered alone or in combination with other evidence-based interventions, such as behavioral support over the internet and FDA-approved smoking cessation medications.

CPSTF Finding (July 2020)

The Community Preventive Services Task Force recommends mobile phone text messaging interventions based on strong evidence of effectiveness in increasing tobacco smoking cessation among adults who are interested in quitting. Systematic review evidence showed meaningful improvements in smoking cessation outcomes when measured six or more months following intervention. Mobile phone text messaging interventions were effective when implemented alone or with other interventions. Effective interventions provided tailored content, interactive features, or both.

Rationale

Basis of Finding

CPSTF selects and evaluates recently published systematic reviews to provide program planners and decision-makers with effective intervention options. A team of specialists in systematic review methods and tobacco cessation research, practice, and policy selected and evaluated the following published review:

Whittaker R, McRobbie H, Bullen C, Rodgers A, Gu Y, Dobson R. Mobile phone text messaging and app-based interventions for smoking cessation. *Cochrane Database of Systematic Reviews* 2019, Issue 10. Art. No.: CD006611. DOI: 10.1002/14651858.CD006611.pub5.

The team also abstracted information from the included intervention studies and conducted additional analyses. The CPSTF finding is based on results from the published systematic review and meta-analyses, additional analyses of data from included studies, and expert input from team members and CPSTF. This recommendation updates and replaces the [2011 CPSTF finding](https://www.thecommunityguide.org/sites/default/files/Tobacco-Mobile-Phone-Based-Cessation-2011.pdf) [https://www.thecommunityguide.org/sites/default/files/Tobacco-Mobile-Phone-Based-Cessation-2011.pdf] of sufficient evidence of effectiveness for mobile phone-based cessation interventions.

The Whittaker et al. review included 26 studies (search period through October 2018). Authors examined the effectiveness of interventions that included mobile phone text messages (19 studies), or applications, or apps, alone (5 studies) or in combination with carbon monoxide monitoring (2 studies). The CPSTF review focused on the subset of 19 studies that evaluated mobile phone text messaging interventions.

Whittaker et al. separated the 19 studies into the following four categories for analysis; two of the studies contributed study arm comparisons to more than one category.

1. Interventions used alone or in combination with other interventions when compared to minimal cessation support (i.e., usual care or printed cessation educational materials; 14 study arms from 13 studies)
2. Interventions added to cessation support interventions (e.g., counseling) when compared to those interventions used alone (4 study arms from 4 studies)
3. Interventions added to an internet-based cessation intervention when compared with text messaging alone (1 study arm from 1 study)
4. Interventions that send text messages with high frequency when compared with interventions that send messages with low frequency (4 study arms from 3 studies)

Results of their analyses are summarized in Table 1.

Table 1. Intervention Effects on Smoking Cessation

Smoking cessation reported 6 or more months following intervention	Number of Studies*	Risk Ratio (95% Confidence Interval)	Direction of Effect
Mobile phone text messaging interventions used alone or with other interventions compared to minimal cessation support	13	1.54 (1.19, 2.00)	Favors the intervention
Mobile phone text messaging interventions added to cessation support interventions when compared to those interventions used alone	4	1.59 (1.09, 2.33)	Favors the intervention
Mobile phone text messaging interventions added to an internet-based cessation intervention when compared to text messaging alone	1	1.80 (1.32, 2.45)	Favors the intervention
Interventions that send text messages with high frequency when compared with interventions that send messages with low frequency	3	1.00 (0.95, 1.06)	No significant difference

*Two studies provided study arm comparisons in more than one category

The review team calculated absolute percent differences in smoking cessation rates. They stratified evidence into two subsets to examine the effectiveness of mobile phone text messaging interventions when implemented alone and when combined with other cessation support interventions. The analysis excluded two studies that only examined differences in text message frequency. The CPSTF recommendation is based on evidence from 17 studies that compared mobile

phone text messaging interventions when implemented alone (7 studies) or when added to other interventions (10 studies). Results of these subset analyses are summarized in Table 2.

Table 2. Intervention Effects on Smoking Cessation: Subset Analysis

Smoking Cessation reported 6 or more months following intervention	Number of Studies	Absolute Percent Difference: Median (IQI)	Direction of Effect
Mobile phone text messaging interventions alone or in combination with other cessation support interventions	17	4.1 percentage points (IQI: 0.9 to 5.8 percentage points)	Favors the intervention
Subset of studies evaluating mobile phone text messaging interventions when implemented alone	7	2.3 percentage points (IQI: 1.0 to 4.5 percentage points)	Favors the intervention
Subset of studies evaluating mobile phone text messaging interventions when combined with other cessation support interventions	10	4.4 percentage points (IQI: -1.2 to 11.4 percentage points)	Favors the intervention

IQI: Interquartile interval

The 19 studies of mobile phone text messaging interventions included in the Whittaker et al. review recruited a median of 503 participants. Adults who smoked were recruited in a variety of different ways, including internet or email solicitation (10 studies), media ads (7 studies), and referrals from health care systems (8 studies). Cessation outcomes were based on self-reported data alone (12 studies) or biochemical verification (7 studies). Only three studies examined cessation outcomes beyond the 6-month study inclusion criteria. Additional studies are needed to determine the effectiveness of mobile phone text messaging interventions on longer term cessation outcomes.

Applicability and Generalizability Issues

Intervention settings

The CPSTF finding is applicable to U.S. settings. Included studies in Whittaker et al. were conducted in the United States (6 studies), China and Hong Kong (4 studies), the United Kingdom (3 studies), Australia (2 studies), New Zealand (2 studies), Spain (1 study), and Switzerland (1 study).

One of the U.S. studies was conducted in New York City; the remaining five recruited participants nationwide. One U.S. study that examined comparative effectiveness based on text message frequency was excluded from the CPSTF subset analysis. The remaining U.S. studies found that smoking cessation increased by a median of 4.4 percentage points (IQI: 0.4 to 11.9 percentage points, 5 studies), which is similar to the overall body of evidence on effectiveness.

Population characteristics

The CPSTF finding is likely applicable to adults in the United States who want to quit smoking. Overall, the median study age was 36.5 years. One study recruited younger participants with a mean age of 18 years. None of the included studies provided stratified results for adolescents or adults aged 65 years or older. A median of 52.3% of study participants were female and a median of 47.7% were male. Additional studies are needed to determine effectiveness of mobile phone text messaging interventions in helping adolescent smokers quit.

U.S. studies that reported information about race and ethnicity included Black or African American persons (median of 19% from 5 studies), and Hispanic or Latino persons (median of 9.6% from 5 studies). Among studies that reported education level, a median of 29.6% of participants had a high school degree or less (6 studies). Three studies reported on household income and found that a median of 57.3% of participants had an annual income less than \$35,000, and four studies reported that a median of 46.3% of participants were unemployed. None of the included studies reported stratified analyses of smoking cessation outcomes based on these characteristics.

Intervention characteristics

The CPSTF finding is applicable to a range of intervention characteristics. Mobile phone text messaging interventions were effective when implemented alone or with other interventions, including counseling (3 studies), web-based materials or email messages (2 studies), nicotine replacement therapy (2 studies), printed materials (2 studies), or a mobile phone app (1 study).

More than half of the mobile phone text messaging interventions included both interactive features and message content that was tailored to participants (11 studies). Cessation outcomes from these studies were similar to those from studies that included only one of these two characteristics (3 studies). Cessation outcomes were mixed for the subset of three studies that evaluated text messaging interventions with neither interactive features nor tailored content.

Data Quality Issues

The CPSTF assessment adopted the data quality methods and findings from the Whittaker et al. review. The published systematic review included only randomized controlled trials. The authors evaluated the studies using a modified Cochrane risk of bias assessment tool (Higgins et al. 2017), which has five domain-specific assessments (random sequence generation, allocation concealment, blinding of outcome, incomplete outcome data, other sources of bias) and an overall risk of bias rating. Ten of the 19 mobile phone text messaging interventions studies were rated as having low risk of bias. Two studies were rated as high risk of bias, and seven studies were rated as unclear risk of bias. No studies were excluded from analyses in either the published review or the CPSTF assessment based on assigned risk of bias rating.

Potential Benefits

The Whittaker et al. review did not report on any additional benefits of mobile phone text messaging interventions. The included studies did not describe or evaluate any potential additional benefits.

Potential Harms

The Whittaker et al. review did not report on the presence or absence of potential harms. None of the included studies reported harms associated with the interventions. CPSTF notes that text messages may be a source of distraction for clients engaged in other activities such as driving.

Related Reviews and Recommendations

Three recently published systematic reviews examined mobile phone text messaging interventions alone or as part of a broader review of digital health interventions for smoking cessation.

- Cha et al. (2019) conducted a narrative assessment of the evidence for text messaging interventions when implemented alone and noted no significant effect on short term (3 to 6 month) cessation outcomes (6 studies).

- Do et al. (2018) examined the evidence on effectiveness of different digital health interventions for smoking cessation. The authors identified six studies of text messaging interventions and found evidence of effectiveness (risk ratio 1.80; 95% confidence interval [CI] 1.54, 2.10; 6 studies), but noted substantial heterogeneity.
- Scott-Sheldon et al. (2016) included 20 text messaging intervention studies and examined smoking cessation outcomes by type of abstinence measure (with no restrictions on duration of follow-up). Meta-analyses found significant increases when measured as 7-day point prevalence of abstinence (odds ratio [OR] 1.38, 95% CI 1.22, 1.55; 16 study arms) as well as continuous abstinence (OR 1.63, 95% CI 1.19, 2.24; 7 study arms).

[Smoking Cessation: A Report of the Surgeon General](https://www.cdc.gov/tobacco/data_statistics/sgr/index.htm) [https://www.cdc.gov/tobacco/data_statistics/sgr/index.htm] concluded that the evidence is sufficient to infer that short text message services about cessation are independently effective in increasing smoking cessation, particularly if they are interactive or tailored to individual text responses. (HHS, 2020). The conclusions of the Surgeon General’s Report align with this CPSTF recommendation for mobile phone text messaging interventions to increase smoking cessation.

The U.S. Preventive Services Task Force (USPSTF) recommends that clinicians ask all adults about tobacco use, advise those who use tobacco to quit, and provide them with behavioral interventions and, for non-pregnant adults, U.S. Food and Drug Administration–approved cessation pharmacotherapy ([A grade recommendation](https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/tobacco-use-in-adults-and-pregnant-women-counseling-and-interventions) [https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/tobacco-use-in-adults-and-pregnant-women-counseling-and-interventions]; Krist et al., 2021; Patnode et al., 2021).

Considerations for Implementation

The following considerations for implementation are drawn from studies included in the existing evidence review, the broader literature, and expert opinion from CPSTF, as noted below.

Based on evidence presented by Whittaker et al., and CPSTF deliberations, CPSTF recommends mobile phone text messaging interventions that include interactive content and tailored guidance, alone or in combination with other interventions. CPSTF has previously recommended other interventions to increase tobacco cessation, including [quitlines](https://www.thecommunityguide.org/findings/tobacco-use-and-secondhand-smoke-exposure-quitline-interventions) [https://www.thecommunityguide.org/findings/tobacco-use-and-secondhand-smoke-exposure-quitline-interventions], [internet-based interventions](https://www.thecommunityguide.org/findings/tobacco-use-internet-based-cessation-interventions) [https://www.thecommunityguide.org/findings/tobacco-use-internet-based-cessation-interventions], and policies to [reduce patient out-of-pocket costs](https://www.thecommunityguide.org/findings/tobacco-use-and-secondhand-smoke-exposure-reducing-out-pocket-costs-evidence-based-cessation) [https://www.thecommunityguide.org/findings/tobacco-use-and-secondhand-smoke-exposure-reducing-out-pocket-costs-evidence-based-cessation] for effective cessation treatments. Improving access to effective, evidence-based interventions for people who want to quit using tobacco is an important component of a [comprehensive tobacco prevention and control program](https://www.thecommunityguide.org/findings/tobacco-use-and-secondhand-smoke-exposure-comprehensive-tobacco-control-programs) [https://www.thecommunityguide.org/findings/tobacco-use-and-secondhand-smoke-exposure-comprehensive-tobacco-control-programs], which is another CPSTF-recommended intervention approach.

Mobile phone text messaging interventions have several conceptual advantages for cessation assistance (Whittaker et al., 2019; CPSTF 2011). These include substantial reach and penetration within important target populations, ease and availability of user access to tailored information and support, potential for consistency in treatment content, scalability to match program resources and consumer demand, and the potential for low per-user costs. Interventions developed in the public sector could be shared or cross-linked by tobacco control programs and organizations.

CPSTF (2011) previously noted that mobile phone-based cessation interventions require ongoing advertising and promotion. Interventions may also need to enhance their services or features to continuously attract and engage people

who want to quit using tobacco. Advertising, cross-promotion, and coordinated web-linkages may help people who use tobacco access the evidence-based cessation intervention that best suits their needs.

CPSTF identified barriers to the implementation and use of mobile phone text messaging interventions including technological concerns (e.g., matching program, network, and client capabilities), costs to clients with limited text and data plans, and ensuring confidentiality of participant information.

This review identified a number of publicly available text message services with interactive features or tailored content to support people in the United States who want to quit using tobacco. Services are typically accessible through websites, which also offer information and support to help people in their efforts to quit.

- The smokefree.gov [https://smokefree.gov/] Initiative, managed by the National Cancer Institute, provides people who want to quit smoking with free, evidence-based smoking cessation information and on-demand support. The initiative offers [nine text messaging interventions](https://smokefree.gov/tools-tips/text-programs) [https://smokefree.gov/tools-tips/text-programs] with online or text opt-in for different groups, including pregnant persons, teens, veterans, Spanish speakers, and people not yet ready to quit.
- The [Tips From Former Smokers®](https://www.cdc.gov/tobacco/campaign/tips/) [https://www.cdc.gov/tobacco/campaign/tips/] website is designed to support CDC's national tobacco education campaign. The website seeks to motivate quit attempts through stories of real people with smoking-related diseases. The website also aims to help people succeed in quitting smoking by connecting them to cessation resources, such as [How to Quit Smoking](https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html?s_cid=OSH_tips_D9755) [https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html?s_cid=OSH_tips_D9755].
- The Truth Initiative offers two free digital resources. [BecomeAnEX](https://www.becomeanex.org/) [https://www.becomeanex.org/] aims to help people quit using tobacco, and [This Is Quitting](https://truthinitiative.org/thisisquitting) [https://truthinitiative.org/thisisquitting] is designed to help young people quit using e-cigarettes.

Evidence Gaps

The CPSTF and Whittaker et al. identified several areas that have limited information. Additional research and evaluation could help answer the following questions and fill existing gaps in the evidence base.

- How do intervention effects vary by participant characteristics, including age (especially among adolescents and older adults), income, level of education, and race/ethnicity in U.S. populations and settings?
- How do intervention effects vary by text message content?
- How do mobile phone text messaging interventions that use interactive features and provide tailored guidance compare with text messaging interventions without these features?
- What are the most effective and efficient ways to increase recruitment and enhance retention?
- What is the impact of these intervention approaches on long-term cessation outcomes (12 months or more)?
- Are these interventions effective with clients who want to quit using e-cigarettes?
- Are these interventions effective with clients who want to quit using smokeless tobacco products?

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