Text Delivered Interventions

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Columbia University
April 28, 2017
Disclosure

Dr. Abroms/GWU has licensed Text2Quit/Quit4baby to Voxiva Inc.

Funding Source

This research was supported by 5K07 (NCI), R15CA167586 (NCI), R44DA035017 (NIDA) to Dr. Lorien Abroms
Aims of Talk

I. Can mobile technology promote smoking cessation?

II. What mechanisms are involved?

III. How can it promote reach?
Technology Use

- 92% of US adults own a mobile phone
- 88% text with their phone
- 68% have smartphones
  - 75% have used their phone to look up health information

(Pew 2015; Pew 2014; CTIA 2014)
### Common Across All Major Groups

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<thead>
<tr>
<th>Race/ethnicity</th>
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<tbody>
<tr>
<td>White</td>
<td>91</td>
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<tr>
<td>Black</td>
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<td>Hispanic</td>
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<table>
<thead>
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<th>Age group</th>
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<td>18-29</td>
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<td>30-49</td>
<td>96</td>
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<tr>
<td>50-64</td>
<td>90</td>
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<tr>
<td>65+</td>
<td>78</td>
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<table>
<thead>
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<th>Household income</th>
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<td>&lt;$30K</td>
<td>86</td>
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<tr>
<td>$30K-$49,999</td>
<td>94</td>
</tr>
<tr>
<td>$50K-$74,999</td>
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<td>$75K+</td>
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<table>
<thead>
<tr>
<th>Educational attainment</th>
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<tbody>
<tr>
<td>Less than high school</td>
<td>86</td>
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<tr>
<td>High school</td>
<td>90</td>
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<tr>
<td>Some college</td>
<td>93</td>
</tr>
<tr>
<td>College+</td>
<td>95</td>
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Pew Research, 2015
Rationale for Text Messaging

1. Reach: Help anywhere and anytime
2. Proactive messages interrupt you
3. Interactive help
4. Personalized help
5. Increase contact over time
6. Unobtrusive and confidential
7. Opportunities for tracking of behavior
8. Goes with smoking

**Drawbacks of Text Messaging**

- Technological challenges to deliver
- Technological challenges to receive (e.g. charged)
- Financial challenges to have service and receive messages; “On and off the grid” (e.g. service, data)
- Privacy: SMS are not secure
Study of Text2Quit

◇ Automated, interactive, personalized text messages for quitting smoking
◇ Messages are timed around quit date
◇ Advice on quitting, peer ex-smoker messages, medication msgs, games, and relapse messages.
◇ On-Demand: need additional motivation, having a craving, relapse.
◇ 2-3 messages/day following quitdate
◇ Developed in 2011

Advice on Quitting

Text2Quit. Tomorrow’s the big day! Throw out all your cigs before bed. Plan to keep busy & avoid smokers. Text CRAVE to fight cravings.

Erika/Text2Quit. 4 more days to go. Don’t talk yourself out of it. Think of why you’re quitting and stay committed. You’ll love being smokefree!

Medication msg

MEDS/Text2Quit. Be sure to have your NRT Patch on hand. Open the pack & read the instructions so that you’re ready to use it tomorrow in the morning.

On demand games & tips

Text2Quit. Reply GAME to play trivia and earn Text2Quit points.

Check-ins

Text2Quit. Did you quit smoking today? Reply YES or NO.
Personalization

- Reasons for quitting
- Triggers
- Gender
- Use of pharmacotherapy
- Stats on money saved and health benefits accrued

Text2Quit. Lorien’s reasons to quit are: To improve my health, To save money, So that I can be there for my kids Lailah, David & Maya
Interaction:

- Track cigarettes smoked
- Track how day went (urges and smoking)
- Weekly smokefree pledge
- Surveys: “Are you ready?”
- “Did you Quit?”

Pledge

PLEDGE/Text2Quit. Make a pledge towards a smokefree life and get your latest Text2Quit quitting stats. Reply PLEDGE.

Pre-Quit Tracking

Text2Quit. Time for a pre-quit check-in. Reply with the number of cigarettes you smoked yesterday (e.g. 16). Find out if you've met your goal.
24-7 Help

- CRAVE
- SMOKED
- STATS

(1/2) Text2Quit. Sorry to hear you smoked! You made a mistake, but you can go back to being a non-smoker.

(2/2) Is this a SLIP where you can go back to not smoking? Or RELAPSE where you are now smoking again? Reply SLIP or RELAPSE.
Timing and Frequency of Texts in Text2Quit

Days after Enrollment

# of Texts Sent Per Day

QuitDate
Randomized Trial of Text2Quit

- Participants recruited on the Internet with Google ad words
- Randomized to receive Text2Quit or a self-help material (Smokefree.gov; Clearing the Air).
- Surveyed at baseline, 1, 3, and 6 months post-enrollment to assess smoking status.
- Saliva collected from self-reported quitters at 6 months
- Those lost to follow up were categorized as smokers.

Be Free Study (N=503)

<table>
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<tr>
<th>Follow-up Survey</th>
<th>Measure</th>
<th>Intervention (SE) (n = 262)</th>
<th>Control (SE) (n = 241)</th>
<th>Relative risk (95% CI)</th>
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<tbody>
<tr>
<td>Primary outcome</td>
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<tr>
<td></td>
<td></td>
<td>Biochemically confirmed RPP</td>
<td>11.1% (.02)</td>
<td>2.22 (1.16 – 4.26)*</td>
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<tr>
<td></td>
<td></td>
<td>abstinence</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-reported RPP abstinence</td>
<td>19.9% (.02)</td>
<td>1.99 (1.27 – 3.13)**</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Secondary outcomes</td>
<td>6 Months</td>
<td>Biochemically confirmed abstinance</td>
<td>15.7% (.02)</td>
<td>1.40 (.89 – 2.20)</td>
</tr>
<tr>
<td></td>
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<td>Not smoked in the past 7 days (%)</td>
<td>31.7% (.03)</td>
<td>1.53(1.13 – 2.07)**</td>
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<tr>
<td></td>
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<td>Not smoked in the past 30 days (%)</td>
<td>24.8% (.03)</td>
<td>1.57 (1.10 – 2.26)*</td>
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<td>3 Months</td>
<td>Not smoked in the past 7 days (%)</td>
<td>33.2% (.03)</td>
<td>1.67 (1.23 – 2.26)**</td>
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<td>Not smoked in the past 30 days (%)</td>
<td>27.5% (.03)</td>
<td>1.70 (1.20 – 2.41)**</td>
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<tr>
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<td>1 Month</td>
<td>Not smoked in the past 7 days (%)</td>
<td>30.5% (.03)</td>
<td>2.10 (1.47 – 3.00)***</td>
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<tr>
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<td></td>
<td>Not smoked in the past 30 days (%)</td>
<td>11.8% (.02)</td>
<td>1.58 (.91 -2.76)</td>
</tr>
</tbody>
</table>

Table 2. Relative risk for smoking outcomesa (n = 503)

Whittaker R, et al.. Mobile Phones for Smoking Cessation.
Cochrane Review: 2016
Increasing Tobacco Use Cessation: Mobile Phone-Based Interventions

Mobile phone-based cessation interventions use interactive features to deliver evidence-based information, strategies, and behavioral support directly to tobacco users interested in quitting. Typically, participants receive text messages that support their quit attempt, and the message content changes over the course of the intervention.

Content may be developed or adapted for specific populations and communities. Messages may be tailored for individuals based on computer algorithms that match messages to information provided by the participant. Programs may be automated, and they may include text responses provided on demand to participants encountering urges to smoke.

Mobile phone-based interventions may be coordinated with additional interventions, such as Internet-based cessation services or provision of medications.

Summary of Task Force Recommendations & Findings

The Community Preventive Services Task Force recommends mobile phone-based interventions for tobacco cessation based on sufficient evidence of effectiveness in increasing tobacco use abstinence among people interested in quitting. Evidence was considered sufficient based on findings from six studies in which mobile phone-based interventions were implemented alone or in combination with Internet-based interventions.
Mobile text messaging for health: a systematic review of reviews.

Hall AK\textsuperscript{1}, Cole-Lewis H, Bernhardt JM.

Abstract
The aim of this systematic review of reviews is to identify mobile text-messaging interventions designed for health improvement and behavior change and to derive recommendations for practice. We have compiled and reviewed existing systematic research reviews and meta-analyses to organize and summarize the text-messaging intervention evidence base, identify best-practice recommendations based on findings from multiple reviews, and explore implications for future research. Our review found that the majority of published text-messaging interventions were effective when addressing diabetes self-management, weight loss, physical activity, smoking cessation, and medication adherence for antiretroviral therapy. However, we found limited evidence across the population of studies and reviews to inform recommended intervention characteristics. Although strong evidence supports the value of integrating text-messaging interventions into public health practice, additional research is needed to establish longer-term intervention effects, identify recommended intervention characteristics, and explore issues of cost-effectiveness.
Text4Baby

1 million + subscribers since launch (2011)

Send free text-messages to pregnant users (3x/week), timed around due date on a variety of health topics.

Messages

John Doe

Contact

Text4Baby: If you smoke, it's important to quit. You'll be proud you did! Test messages to help you quit. Get gift cards if eligible. Reply YES to learn more.

It mothers know best, why don't I know what comes next?

Feeling confused? Now, there's help delivered straight to your cell phone.

Just text BABY to 511411 today, and start getting FREE messages with information to help you through your pregnancy. They're the most important texts you'll get for the next 9 months.

Just text4baby for more information.
Text4baby: Baby weighs about 3 pounds now. Over the next 10 weeks, most babies gain another 4 or more pounds! More info on baby's growth: text4b.org/001.

Quit4baby: Smoking during pregnancy can cause problems with the placenta--the baby's source of food and oxygen. Do something healthy instead like take a walk.
Quit4baby

◇ Automated, interactive, personalized text messages for quitting smoking
◇ Messages are timed around quit date and baby’s due date
◇ Advice on quitting related to benefits to mom and baby, facts on harms of smoking to mom and baby, peer ex-smoker messages, and relapse prevention messages.
◇ Surveys and On-Demand keywords
◇ 5+ messages/day following quitdate
7-day Smoking Abstinence  N=497

Abroms LC, Johnson P. Leavitt LE, Cleary SD, Chiang SC, Brandon TH, Bushar J. A Randomized Trial of a Text-Messaging Program to Promote Smoking Cessation in Pregnant Women. *Under review*
Participant Quit Rate by Pregnancy Status

7-day Smoking Abstinence, N=497

Abroms et al. under review
Quit4baby Summary

- Significant difference in self-reported past 7 day smoking at 1,3 months
- Prepartum effects but not postpartum effects
- Encouraging findings for mCessation in low income pregnant women

Abroms LC, et al. Under review
Aims of Talk

I. Can mobile technology promote smoking cessation?

II. What mechanisms are involved?

III. Can technology promote reach?
mHealth inputs (SMS)

- Advice on quitting
- Peer ex-smoker messages
- Tracking & feedback
- Tools if craving/slip
- Pledge

Intermediate outcomes (Psychosocial)

- Social support
- Self-efficacy
- Behavioral capability

Proximal outcomes (Extra-treatment)

- Call quitline
- Use NRT / medications
- Talk to doctor
- Online community

Health outcome

- Quit smoking

Psychosocial or Extra-Treatment?
(N=409)

• Same rates of extra-treatment seeking at 1 mo (e.g. NRT, quitline, counseling, 1-on1, self-help materials, online community)

• Text2Quit had greater increases in psychosocial (self-efficacy) compared to control (p<.01)

• Self-efficacy significant mediator of effect.

• Accounts for 51.1% of the effect of Text2Quit on Cessation at 6 months

• Only variable with a complete mediational path

• Text messaging programs may be appropriate in low/middle income countries

Can you max out on program effects?

Natural experiment in commercial quitline setting with rollout of Text2quit

- Propensity score matching on intake covariates

- Control Group: 4-call Phone Counseling, NRT, WebCoach (N=4363)
- Enhanced group: control +Text2Quit (N=4363)

- Result: Similar rates of 7-day abstinence at 7 mo (25.3%/25.5%)
- Text2Quit more satisfied
- ➔ Text2Quit not confer benefit for quitting in tandem with quitline services

Aims of Talk

I. Can mobile technology promote smoking cessation?
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Connecting the digital dots

EHRs

Digital Registries

Apps/texting programs

Mobile Phones
Types of Reach

Reactive: Build it and they will come

Proactive: Use SMS for outreach and service.
N=800 approx subscribers

N=~120,000 users
Covers 27 States, 675 employers/
health plans
Participants receive:
1) multiple outbound coaching calls,
   2) Web Coach® 3) Text2QuitSM
-Over 300,000 callers enrolled in
Text2Quit
Proactive: SMS Outreach for SMS program

- Text4baby list
- India government list
- GW MFA: smoker patient list
- Medicaid lists
30 million Promotional SMS sent via gov directories

N=1.8 million enrollments over the span of 10 months (6%)
Types of Reach

Reactive:
- Make available & they will come
- Some success, especially for general smoking cessation text messaging (but not pregnancy) (Heminger et al. 2016)

Proactive SMS Outreach for SMS program
- Found success both in India and Quit4baby
- Open question whether will work from a health system.
Aims of Talk

I. Can mobile technology promote smoking cessation?

II. What mechanisms are involved?

III. Can technology promote reach?
Can mobile technology promote smoking cessation?
Yes, multiple RCT indicate that 70% increase in likelihood of quitting. Emerging evidence with pregnant.

What mechanisms are involved?
Psychosocial changes

Can technology promote reach? Yes, both reactive and proactive methods
Impact=Reach X Efficacy
The future of population health with technology...

Reach:

• Smokers search for apps and digital programs and find ones proven to work
• Patient are screened in EHR as smoker and leave clinical visit with digital program
• Smokers receive outreach by SMS for SMS program
Efficacy

• Proven programs are refined and optimized over time
• Integrated with sensors that connect to smartphone (Smokerlyzer, Smokebeat)
• Integrated with smartphone capabilities --- GPS, calendar…
• Integrated with counselors –real or automated--who are activated in high need situations
Automated text messaging programs are easy to develop

J MIR MHEALTH AND UHEALTH

Original Paper

Recommended Steps for Developing and Pretesting a Text Messaging Program for Behavior Change

Lorien C Abroms¹, ScD; Robyn Whittaker², MBChB, MPH, Ph. D; Caroline Free³, Ph. D, MB ChB; Judith Mendel Van Alstyne¹, MPH; Jennifer M Schindler-Ruwisch¹, MPH

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* these authors contributed equally
Acknowledgments: Thank-you!

Faculty
• A. Graham, Schroeder
• S. Cleary, GWU
• T. Brandon, Moffitt
• S. Bernstein, Yale
• C Heminger, GWU
• A. Boal, consultant
• P. Johnson, Voxiva
• S. Simmens. GWU
• M. Turner, GWU
• D. Shelley, NYU
• D. Evans, GWU
• B Hoeppner, Harvard
• K. Tercyak, Georgetown
• L Westmaas, ACS
• K. Carpenter, Optum
• J. Shuter, Montifiore
• R. Whittaker, U of Auckland
• P. Murthy, National Institute of Mental Health & Neuroscience, India

Students and Staff
• L Leavitt, Consultant
• S. Chiang GWU
• J Schindler-Ruwisch, GWU
• J. Mendel, GWU
• J Bontemps-Jones, ACS
• Allison Goldstein, WHO

Participants in trials:
Text2Quit
Quit4baby
What Did You Like About Text2Quit? (1 Month)  
(n=181)

- **Constant/Reminder**: “That you can [SMS] whenever you are feeling the urge to smoke and in that time frame you are actually not smoking.”
- **On Demand Tools**: “Someone kind of there with you…” “Like a constantly concerned friend”
- **Global Help**: “Texts gave good ideas on how to fight cravings…”
- **Social Support**: “Made me feel accountable.” “[An] electronic conscience”
- **Encouragement**: 
- **Skills/Info**: 
- **Social Control**: 
- **Quantity/Frequency**: 
- **Self-efficacy**: 
- **Other/Not clear**: 

Abroms et al. 2013
What Did You Dislike About Text2Quit? (1 Month) (n=173)

- Nothing: 46.8%
- Message Frequency: 18.2%
- Lacked Personal Interaction: 6.7%
- Content/Info: 6.7%
- Message Timing: 5.3%
- Technical Issues: 3.8%
- Text as a Trigger: 2.7%
- Message Tailoring: 2.4%
- Other/Not clear: 6.7%

Quotes:
- "OMG. TOO MANY TEXTS PER DAY."
- "I would like it more if there was an actual coach ..."
- "Sometimes I would be doing really good...then I would get a text and it would make me start craving and thinking about smoking."
Mobile phone SMS messages can enhance healthy behaviour: a meta-analysis of randomised controlled trials.

Orr JA, King RJ.

Author information

Abstract
Healthy behaviour, such as smoking cessation and adherence to prescribed medications, mitigates illness risk factors but health behaviour change can be challenging. Mobile phone short-message service (SMS) messages are increasingly used to deliver interventions designed to enhance healthy behaviour. This meta-analysis used a random-effects model to synthesise 38 randomised controlled trials that investigated the efficacy of SMS messages to enhance healthy behaviour. Participants (N = 19,641) lived in developed and developing countries and were diverse with respect to age, ethnicity, socioeconomic background and health behaviours targeted for change. SMS messages had a small, positive, significant effect (g = 0.291) on a broad range of healthy behaviour. This effect was maximised when multiple SMS messages per day were used (g = 0.395) compared to using lower frequencies (daily, multiple per week and once-off) (g = 0.244). The low heterogeneity in this meta-analysis (I (2) = 38.619) supports reporting a summary effect size and implies that the effect of SMS messaging is robust, regardless of population characteristics or healthy behaviour targeted. SMS messaging is a simple, cost-effective intervention that can be automated and can reach any mobile phone owner. While the effect size is small, potential health benefits are well worth achieving.

Multiple messages a day
Across a wide range of health behaviours ranging from appointment reminders to ART medication adherence.