Do you smoke after text? Results of a randomized trial of smoking cessation using mobile phone text messaging

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Declaration

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Subject: Ebusiness Technologies
Course: BUSINESS CONSULTING MASTER
Paper Title: “Do you smoke after text? Results of a randomized trial of smoking cessation using mobile phone text messaging”.

Length
This paper is 3360 words in length (including title page, table of contents, summary, acknowledgements, preface, appendices and list of sources including notes) and is thus equivalent to 14 pages in length.

In writing this paper, I have used the above mentioned case study as the main source and cited all other published sources used, including Internet sources, as follows:

• Direct quotations are marked as quotations, and the source of each quotation is documented.

• The sources are also clearly indicated and documented for material summarized or paraphrased from the work of other writers.

• Sources are cited in the text in parentheses where the material is used and full documentation is provided in the reference list/works cited.

I may have discussed the paper with others and used advice and suggestions from others in writing it, but the paper is my own original work and is neither copied from another source without proper acknowledgement, nor written for me by another person, in whole or in part.

Signed: Sarath Chandra Renukuntla
Date: 29/06/2012
FOREWORD

People have a fundamental right to breathe clean air. There is no safe level of exposure to second-hand smoke (SHS), which causes heart disease, cancer and many other diseases. Even brief exposure can cause serious damage. Guidelines to Article 8 of the WHO Framework Convention on Tobacco Control (WHO FCTC) help countries know exactly what to do to protect their people from SHS. Many cities have every authority to pass comprehensive smoke-free laws to eliminate SHS exposure. Most cities will at least have the authority to prohibit tobacco smoke in certain types of workplaces, for example, local public transportation and municipal public buildings. Mayors and other city leaders can directly advocate for national comprehensive smoke-free laws. WHO is committed to fight the global tobacco epidemic. The WHO Framework Convention on Tobacco Control entered into force in February 2005. Since then, it has become one of the most widely embraced treaties in the history of the United Nations with more than 170 Parties covering 87% of the world’s population. In 2008, WHO introduced a package of tobacco control measures to further counter the tobacco epidemic and to help countries to implement the WHO Framework Convention, known by their acronym MPOWER.

Tobacco control policy, 2010

3 World Health Organization http://www.who.int/gho/tobacco/en/
Abstract

This scientific paper observes the role of a mobile phone text messaging in stopping or quitting smoking. For many years, the telephone has been a medium for helping tobacco users quit smoking. In the early 1980s, a toll-free cancer hotline in the United States, the Cancer Information Service, found that many callers wanted information on quitting smoking and responded by providing the first telephone based cessation service. This is based on a randomized controlled trial which was setup in New Zealand and this trial was done on a certain group of smokers who wanted to quit smoking by receiving advice, support, and distraction through mobile text messages from an intervention group. The trial period ranged from the participant’s quit day to six months. After careful observation follow up data was collected at six weeks and at six months respectively. This resulted in more participants quitting at six weeks with the intervention compared to the control group. The effect of this trial was consistent across subgroups defined by age, sex, income level, or geographic location. Quit rates remained high at six months, but there was no sufficient follow up which resulted some uncertainty between group differences. The main objective of this trial was to help young smokers to quit with new means which in this case was text messages which are cheap, personalized, age appropriate and not location specific. This trial opens up a necessity to test these findings in different settings in the future and increase the assessment period on long term quit rates.

1. Introduction

There is a dire need for new ideas or programmes to help young adults in quitting smoking. Most of these young smokers start smoking in their teens but slowly after a period of time most of the smokers want to quit or cut down. However, very little help is being provided by health care professionals and nicotine replacement therapies are not fully used by these smokers. Lack of “quit smoking” programmes and awareness campaigns are directly resulting in very less number of quitters of smoking.
For example, 80% of Americans seek health-related information on the internet, and 9% of all internet users have searched for information on how to quit smoking. Others have used multiple components (email, web pages, text messages, and calls) and found a positive effect. Texting is another intervention that can be delivered proactively. Some studies have reported positive results. More research is anticipated, especially related to smart phone applications and social networking. The potential for population impact seems enhanced by the fact that these new modes of communication will soon be ubiquitous. Mobile phones could be a right choice in using as a platform to help the smokers to quit. Almost every young and adults own mobile phones in most of the countries. There are more mobile phone users than owners of fixed line telephones in the world at the moment. Mobile phones are being used at low cost to communicate wherever the person is located. Hence this medium could be used to provide some educational materials with existing evidence of effectiveness of smoking cessation.

1.1 Methods

A randomized trial has been conducted using mobile phone text messaging to young and adults to make them aware of effects of smoking and provoke them to quit smoking.

1.2 Participants

Below are the participant’s criteria:

1. Aged 16 years or more who wish to quit smoking.
2. Able to send and receive text messages in a Vodafone mobile network.
3. Able to speak English and willing to participate in the study.
4. No restrictions on data collection through mobile phone or by personal visits for salivary cotinine assessment.
5. Participants are chosen from popular website’s Adds, media articles, email and text message mailing lists, and posters at education institutions.

2. Interventions

These participants were assigned either to a control group or to a group that received a support programme. All participants were informed at their initial interview about the Quit line and also about government subsidy for nicotine replacement therapy that was available. Participants

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5 Zhu SH, Lee M, Zhuang YL, Gamst A, Wolfson T. Interventions to increase smoking cessation at the population level: how much progress has been made in the last two decades? Tob Control. 2012;21(2):110-8

6 Do u smoke after txt? Results of a randomised trial of smoking cessation using mobile phone text messaging A Rodgers, T Corbett, D Bramley, T Riddell, M Wills, R-B Lin, M Jones Tobacco Control 2005
received interventions based around setting a quit date within 30 days of randomization. They were sent regular, personalized text messages providing smoking cessation advice, support, and distraction.

These messages are of below type:

- Symptoms to expect on quitting.
- Tips to avoid weight gain and improve nutrition.
- Tips to cope with craving.
- Advice on avoiding smoking triggers.
- Instructions on breathing exercises to perform instead of smoking.
- Motivational support (for example success stories, feedback on amount of money and life years saved) and distraction (for example, general interest, sports, fashion, trivia, travel).

A multidisciplinary team of young adults, Health researchers, and experts in adolescent health, nutrition, cognitive behavioural therapy, and smoking cessation has developed these messages which were mostly related to quitting and some of them were of general interest. An algorithm based on keyword matching was developed to match participant characteristics (preferences, smoking history, barriers to cessation, etc) with a database of over 1000 text messages so that an individualized programme was provided. Each participant was given a quit day and five messages were sent per day for the week leading up to the quit day and the following four weeks. A free month of outgoing text messaging also started on the quit day, participants were encouraged to tell all their friends and family that they are quitting smoking on that day. Six weeks after randomization, coinciding approximately with the end of the free text messaging month, the intensity of the intervention became less, and number of sent text messages reduced from five a day to three per week until the end of the 26 week (that is, six month) follow up. Control group participants only received one text message every two weeks, thanking them for being in the study.

2.1 Objectives

Assess whether a programme of text messaging could increase smoking cessation.

3. Outcomes

The main result of the trial was the existence of current non-smoking (that is, not smoking since a week) six weeks after randomization. Secondary outcomes included:

Biochemically verified abstinence at six weeks
Self reported current non-smoking at 12 and 26 weeks
Continuous abstinence at 26 weeks that is, 24 week continuous abstinence.
Potential adverse outcomes are rates of car crash, pain in the thumb or finger joints when Texting during the six months. All baseline data collection was collected by text messaging and follow up data obtained using voice and text messaging. A 10% random sample of participants from three main cities (Auckland, Wellington, and Christchurch) was selected at baseline for personal visits at a time and place of their choice to assess salivary cotinine concentrations. In addition, a random sample of 100 participants from these cities who reported quitting at six weeks was selected for salivary cotinine assessments. People collecting and analyzing the samples were unaware of treatment allocation.

3.1 Sample size

A sample size of 1700 was selected to provide 90% power to detect a one third increase in reported smoking cessation with 90% power at p=0.05, assuming a 30% rate of reported quitting in the control group.

3.2 Randomization

Age, sex, number of cigarettes, and stage of change are used as stratification factors in the minimization algorithm.

3.3 Allocation concealment

Central telephone randomization was employed, with the sequence concealed until interventions were assigned.

3.4 Implementation

Research staff taking the calls generated the allocation sequence, enrolled participants, and assigned participants to their groups.

3.5 Blinding (masking)

Participants were aware of which group they were allocated to, but follow up methods were identical for all participants, with any follow up phone calls made by staff unaware of the treatment allocation.
4. Statistical methods
Simple χ2 analyses compared the proportion quit by treatment group, with estimation of relative risks, 95% confidence intervals, and two sided p values. The number of cigarettes smoked and Fagerstrom score (a measure of nicotine dependence) during follow up were compared with analysis of covariance. The role of possible baseline effect modifiers including the stratifying variables and confounders was assessed with standard logistic regression analyses and was to be reported if the estimate of treatment effect on the primary outcome changed by greater than 10%. Participants without follow up data were assumed to be still smoking in the primary analysis. Secondary analyses were performed assuming that participants with no follow up data either: had the same smoking status as at last follow up; or were all non-smoking; or were all smoking in the intervention group. Additional sensitivity analyses assumed that the rate of non-confirmed quitters for the whole trial was the same as for the sample assessed for salivary cotinine. Pre specified subgroup analyses were planned providing there was a treatment effect of at least three standard deviations in the primary outcome.

Recruitment and Retention of participants

Participants-Follow-up Metrics

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Number of participants with follow up data at each time point</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>Number randomised</td>
<td>853 (50.0)</td>
</tr>
<tr>
<td>Number with follow up data at 6 weeks</td>
<td>818 (95.9)</td>
</tr>
<tr>
<td>Number with follow up data at 12 weeks</td>
<td>788 (92.3)</td>
</tr>
<tr>
<td>Number with follow up data at 26 weeks</td>
<td>674 (79.0)</td>
</tr>
</tbody>
</table>

Effects after 6 Weeks

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Treatment effects on number of participants achieving smoking cessation at six weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control n (%)</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>Main analysis</td>
<td>109 (12.8)</td>
</tr>
<tr>
<td>Sensitivity analyses</td>
<td></td>
</tr>
<tr>
<td>Missing status: assumed smoking</td>
<td>144 (16.9)</td>
</tr>
<tr>
<td>Missing status: assumed not smoking†</td>
<td>144 (16.9)</td>
</tr>
<tr>
<td>Adjustment for salivary cotinine verification‡</td>
<td>51 (6.2)</td>
</tr>
<tr>
<td>Adjustment for salivary cotinine verification and test attendance§</td>
<td>20 (2.4)</td>
</tr>
<tr>
<td>Restriction to only those with salivary cotinine verification</td>
<td>6 (0.7)</td>
</tr>
</tbody>
</table>

*Assumes all participants with missing smoking status were smoking.
†Assumes all participants with missing smoking status were not smoking.
‡Assumes participants with missing smoking status in the control group were not smoking but participants with missing smoking status in the active group were smoking.
§Assumes the proportion of non-confirmed quitters in the sample assessed for salivary cotinine (that is, 23/49 = 0.47) was the same for the whole trial population.
| CI, confidence interval; RR, relative risk. |


5. Results

5.1 Baseline characteristics and follow up

The mean age of participants was 25 years and 58% were female. At baseline, the mean (SD) number of cigarettes smoked per day was 15 (3), and the average number of previous quit attempts was two per person. Overall 27% of people had previously used a nicotine replacement product and less than 10% had used any other product or service. Of 101 individuals selected for salivary cotinine verification of baseline smoking status, a total of 61 attended the test, of whom 56 (92%) had concentrations of over 15 ng/ml (that is, were confirmed as current smokers). Follow up data were available from 95% of participants for the primary outcome at six weeks (fig 1, table 2).

5.2 Effects after stopping smoking at six weeks

The primary outcome of smoking cessation at six weeks was more common in those allocated to the active group. More participants reported quitting at this time point in the active group compared to the control group: 239 (28%) v 109 (13%), relative risk 2.20, 95% confidence interval (CI) 1.79 to 2.70; p < 0.0001 (table 3).

A number of sensitivity analyses were performed to assess the potential impact of missing follow up data, misclassified quit status, and adjustment for baseline prognostic variables (table 3). As can be seen, under all the relevant scenarios there remains a statistically definite increase in smoking cessation rates at six weeks, even under the most conservative assumptions. However, assuming that the rate of true quitters for the whole trial was the same as for the sample assessed for salivary cotinine, the absolute difference in quit rates at six weeks is reduced (7.7% in the adjusted analyses, as compared to 15.3% in the unadjusted analyses). Thus the “number needed to treat” was approximately 13—that is, one extra quitter for every 13 allocated the intervention.

5.3 Effects on smoking cessation at 12 and 26 weeks

An increase is shown for non-smoking in the active group compared to the control group at 12 weeks follow up. There was an increase in reported quit rates among the control group (from 13% at six weeks to 24% at 26 weeks). At 26 weeks, there were more participants in the active group who had abstained from smoking for 24 weeks, but the confidence intervals were wide, ranging from little or no effect to a more than a doubling in abstinence rates.
6. Effects on other outcomes

A survey was conducted on those who have quit at 26 weeks. The distribution of answers were skewed to being more confident in the active group ($\chi^2$ test $p=0.04$)—for example, 71 (33%) of quitters in the active group felt extremely confident in staying quit, compared to 41 (20%) in the control group. Among those smoking at 26 weeks, there was a small reduction in the number of cigarettes smoked per day (7.3 v 8.5, $p = 0.03$), a shift in the distribution of stage of change towards preparedness for quitting ($p = 0.005$), but no clear difference in Fagerstrom scores (3.4 v 3.2, $p = 0.4$).

During the 26 week study period there was no difference in the rate of pain in the thumb or finger joints during texting; 52 (6.1%) in the active group compared to 48 (5.6%) in the control group (RR 1.08, 95% CI 0.74 to 1.59; $p = 0.7$). There was also no difference in car crash rates: 38 (4.5%) in the active group versus 43 (5.0%) in the control group (RR 0.88, 95% CI 0.56 to 1.35; $p= 0.6$). Overall, a total of five crashes occurred during or after sending a text message and three occurred while smoking.

7. Discussion

This trial showed that a text messaging based smoking cessation programme about doubled quit rates at six weeks. Reported quit rates remained high at six months, but there was some uncertainty about between group differences because of incomplete follow up.

The two main shortcomings of the trial lay in the over-reporting of quitting status and the comparatively large and differential loss to follow up. Over-reporting of quit status is a common finding in smoking cessation studies, especially among young adults. Initial piloting indicated that without an incentive, follow up rates might be low for this age group, especially in the control group. Because of resource constraints, incentive (a month of free text messaging) was given to the control group to continue with follow up. Consequently follow up rates reduced to around 67% in the intervention group and 78% in the control group by six months. The reported quit rates increased over time in the control group, suggesting that some participants thought that their free text month was dependent on them reporting to have quit. This would lead to underestimation of treatment effects at six months. This mobile phone text messaging programme offers potential for a new way to help young smokers to quit, with the advantages of being relatively inexpensive, personalised, and age appropriate. It might also lead to major new players entering the smoking cessation field, such as mobile phone operators and handset manufacturers, whose marketing campaigns are highly influential among young adults.
What is in the future for smoking?

Health care workers have become extremely active in publicizing the negative effects of smoking. In fact, health care workers have been instrumental in passing various legislation to limit smoking in public; as a result, the proportion of people in the US who smoke has dropped from 40.4% in 1965 to around 19% in 2010 (data from the US Department of Health) 10. One interesting area of the current research on smoking is the study of the population distribution of the genes for smoking (genetic epidemiology). (Genes determine an individual’s inherited characteristics.) What determines which individuals will become nicotine-dependent? Investigators have found that smoking initiation (the obligatory first step) and the development of nicotine dependence are both influenced by genetic factors. The next step will be to identify these genes and learn how they work in order to facilitate the development of effective prevention and treatment strategies for tobacco addiction. According to the American Cancer Society, the majority of cigarette use begins before a person reaches 18 years of age.

Conclusion

Overall, 19% of adults aged 18 years and over were current cigarette smokers, 21% were former smokers, and 60% had never smoked at least 100 cigarettes in their lifetime. Twenty-one percent of men were current smokers compared with 18% of women. Sixty-five percent of women had never smoked compared with 53% of men.12 An ongoing dialogue between quitline research and practice early telephonic cessation programmes had few research results to guide the provision of service. Perhaps in consequence, they provided only brief service, and only on a reactive basis. The next generation of telephonic cessation programmes operationalised these findings and, in so doing, shaped how quitlines are generally thought of today, as comprehensive, proactive, multisession behaviour modification counseling programmes. Will technological innovations in telephony or web based applications increase programme effectiveness? 13 Future research should test improvements in this programme, including the opportunity for integration with existing programmes (especially Quitlines and nicotine replacement therapy provision) and use of newer multimedia phones, which offer further opportunities for provision of quit information and distraction activities.


13 Anderson CM, Zhu SH. Tobacco quitlines: looking back and looking ahead. Tob Control. 2007 ;16 Suppl 1:i81-6
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2. World Health Organization.

3. World Health Organization.
   http://www.who.int/gho/tobacco/en/


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   Results of a randomised trial of smoking cessation using mobile phone textmessaging. Tob Control. 2005


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