

Electronic prompts significantly increase response rates to postal questionnaires: a randomized trial within a randomized trial and meta-analysis

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Accepted 21 January 2015; Published online 27 January 2015

Abstract

Objectives: To assess the effectiveness of sending electronic prompts to randomized controlled trial participants to return study questionnaires.

Study Design and Setting: A “trial within a trial” embedded within a study determining the effectiveness of chronic obstructive pulmonary disease (COPD) screening on smoking cessation. Those participants taking part in COPD who provided a mobile phone number and/or an electronic mail address were randomized to either receive an electronic prompt or no electronic prompt to return a study questionnaire. The results were combined with two previous studies in a meta-analysis.

Results: A total of 437 participants were randomized: 226 to the electronic prompt group and 211 to the control group. A total of 285 (65.2%) participants returned the follow-up questionnaire: 157 (69.5%) in the electronic prompt group and 128 (60.7%) in the control group [difference 8.8%; 95% confidence interval (CI): −0.11%, 17.7%; $P = 0.05$]. The mean time to response was 23 days in the electronic prompt group and 33 days in the control group (hazard ratio = 1.27; 95% CI: 1.105, 1.47). The meta-analysis of all three studies showed an increase in response rate of 7.1% (95% CI: 0.8%, 13.3%).

Conclusion: The use of electronic prompts increased response rates and reduces the time to response. © 2015 Elsevier Inc. All rights reserved.

Keywords: Reminder system; Data collection; Randomized trial; Research methodology; Short messenger service; Electronic mail

1. Introduction

Within randomized controlled trials (RCTs), postal questionnaires are frequently used to elicit responses from participants. Postal questionnaires are often chosen when designing a trial as they are an inexpensive data collection tool, easy to administer, and can be used to access a large geographical area [1]. One issue with postal questionnaires is, however, when they are not filled in and returned by the participant, this can mean that bias can be introduced into the study. It is essential for the internal validity of a randomized trial that a high response rate to questionnaires is received [2]. High attrition and potentially introducing bias into a study will also reduce the power of the study as the sample size is reduced [3]. Furthermore, a rapid response rate to

postal questionnaires is also desirable to establish treatment effects within a given period. Slow response may underestimate the speed of a treatment's effect.

Using methods to increase response rate (and therefore reduce attrition) and time to response is essential and necessary. One such method could be the use of electronic prompts. This refers to participants being sent a reminder either as electronic mail or a short message service (SMS) for a mobile phone. The benefits of these types of electronic prompts are that they are not resource intensive, as they can be automated, and consequently, they can be used to reach a large number of participants easily and quickly. It is estimated that 93% of adults in 2014 own/use a mobile phone in the United Kingdom [4], thus suggesting that they could be a useful means of contacting participants in a research study.

There are few studies in the area of using electronic prompts to reduce attrition in randomized trials. As far as we know, there are only two published trials: both from the York Trials Unit. One small study found that electronic prompts, although increasing response rates by 3%, did not reduce the

Conflict of interest: None.

Funding: This study was funded by the York Trials Unit at the University of York.

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What is new?**Key findings**

- Attrition in randomised controlled trials is an important issue. There have been relatively few ‘trials within trials’ of interventions to reduce trial attrition. We undertook a trial of electronic reminders (SMS/email) for questionnaire return.
- The trial within a smoking cessation trial found a significant reduction in attrition and improvement in time to response.

What this adds to what was known?

- Combining this with two previous studies in meta-analysis showed a significant reduction in attrition of 7%.

What is the implication and what should change now?

- Randomise trials among middle aged people using postal questionnaires should send electronic reminders to reduce attrition. Future research should look either in different populations (younger or older) or modification of message.

time to response and the difference in response rates was not statistically significant [1]. However, this study had fewer than 130 participants and had low statistical power to show a useful difference. Similarly, in a slightly larger trial, Ashby et al. [5] found that electronic prompts, although again showing a small increase in response rates (5%), that was not statistically significant, did show a statistically significant decrease in the time to response. Both of those trials were nested within larger randomized trials.

A recent (2013) systematic review by Brueton et al. [6] of looking at methods to improve retention in randomized controlled trials only found our two previous studies of using electronic prompts vs. no electronic prompts for reducing attrition in RCTs. Consequently, larger studies of electronic prompts are needed that are in the context of reducing questionnaire attrition within randomized trials.

The aims of this RCT were to assess the effectiveness of using electronic prompts (both email and SMS) to improve response rates and reduce time to response in a population of participants who were in a randomized trial of a diagnostic pathway among smokers for chronic obstructive pulmonary disease (COPD) [7].

2. Materials and methods

There are relatively few “trials within trials” examining different methods of reducing attrition in RCTs. The

systematic review by Brueton et al. [6] found only 38 randomized trials of interventions to reduce attrition. This present study is a nested RCT within an established research study “Determining the Optimal approach to identify individuals with Chronic obstructive pulmonary disease” (DOC) [7]. DOC is a case-finding study for COPD and a randomized trial of the impact of case finding on smoking cessation, which involves a population of smokers aged 35 years or more undertaking lung function tests and symptom-based questionnaires. As part of the DOC study, participants were asked to complete a postal follow-up questionnaire. Two reminder letters were sent in an attempt to encourage response. The first reminder letter was sent 2 weeks after the follow-up questionnaire, and the second reminder was sent 2 weeks later (i.e., 4 weeks after the follow-up questionnaire). The follow-up questionnaire was sent to participants between 2 and 6 months (depending on study site) after the date of randomization.

To investigate whether sending an electronic prompt is an effective means of increasing the response rate for returning the follow-up questionnaire, DOC participants who supplied mobile phone numbers and/or email addresses were randomized into two groups: to either receive an additional electronic prompt (email and/or text messages) to return their questionnaire or to receive no additional prompt. This was in addition to the two reminder letters that all DOC participants received. At recruitment, patients were asked for consent for us to contact via their mobile phone or email when they gave us these details.

We deliberately used the same methods as in our two previous trials [1,5] to facilitate a meta-analysis of the results. This is because when planning such trials we cannot usually undertake a study large enough to capture the small but important differences in attrition as our sample size is always restricted by the sample size calculations of the “main” RCT. Therefore, we envisaged, a priori, that we would combine all three studies in a meta-analysis.

As with our two previous studies, participants received the prompt at the same time as they were expected to receive their postal follow-up questionnaire (i.e., 2 days after the questionnaire was sent). The electronic prompt was a text message, email message, or both depending on the contact details provided: The email received was Thank you for your involvement in the DOC study. We really appreciate your help with this study. We recently sent you a questionnaire along with a freepost envelope in connection with this study, which you should by now have received. Your answers are really important so we would be very grateful if you could return your completed questionnaire as soon as you can. If you have already returned the questionnaire please accept our apologies and ignore this email. Thank you again for your help with this study. The SMS sent was: DOC Study: You should by now have received a questionnaire from us to complete. Your answers are important so please help by returning it as soon as you can. Thank you.

2.1. Statistical analysis

The participants in this study were a convenience sample from the DOC trial that had consented to be part of the main DOC study and provided their mobile number and/or email address; hence, there was no formal sample size calculation performed.

Participants were securely randomized to either receiving an electronic prompt or not by the data manager at York Trials Unit (Department of Health Sciences, University of York). Simple randomization between the two groups was undertaken without any blocking or stratification. The data manager was unaware of any baseline characteristics of participants before randomization.

The primary outcome in this present study was the response rate for the return of the DOC study follow-up questionnaire. In addition to this, the time to return the questionnaires was also estimated.

All statistical analyses were conducted in Stata (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX, USA: StataCorp LP) using two-sided significance tests at the 5% significance level on an intention-to-treat basis. Baseline data were summarized by randomized group. The questionnaire response rates were compared by randomized group using a chi-square test. Unadjusted and adjusted odds ratios (ORs) and 95% confidence intervals (CI) were also calculated (adjusting for age, gender, treatment allocation, and general practice). Age, gender, and treatment allocation were treated as fixed effects and practice as a random effect using robust standard errors. The time to return the questionnaire was plotted using Kaplan–Meier survival curves, and the log-rank test was used to compare the two randomized groups. Cox regression was used to adjust for age, gender, treatment allocation (test now for COPD, waiting list for testing for COPD—which was the host trial), and general practice. Participants who returned their questionnaire after 56 days and those who did not return

their questionnaire were treated as censored, and their response time was recorded as 56 days. This point was arbitrary, we felt that 8 weeks (56 days) after the questionnaire was sent was a useful compromise between allowing sufficient time to respond and data becoming “out of date.”

2.2. Review and meta-analysis

We searched the latest Cochrane review [6] of interventions to reduce attrition in randomized trials for other RCTs of electronic prompts to reduce attrition and include these in a fixed-effects meta-analysis. We did not search further than the Cochrane review because of the fact it was a comprehensive and up to date review, and we would be unlikely to find any more recent relevant trials.

3. Results

Of a total of 437 eligible participants, 226 participants (51.7%) were randomized to receive an electronic prompt via SMS or email when the follow-up questionnaire was due and 211 participants (48.3%) were randomized to control (Fig. 1).

A total of 285 participants (65.2%) returned the follow-up questionnaire: 157 (69.5%) in the SMS/email group and 128 (60.7%) in the control group (difference = 8.8%; 95% CI: −0.11%, 17.7%). There was some evidence of a difference in response rates between the two randomized groups ($\chi^2 = 3.73$; $P = 0.05$). The OR for the electronic prompt group compared with the control group was OR = 1.48 (95% CI: 0.99, 2.19; $P = 0.05$), and adjusted was OR = 1.43 (95% CI: 1.25, 1.65; $P < 0.001$) (Table 1).

The median time to return the follow-up questionnaire was 23 days in the electronic prompt group and 33 days in the control group (Table 2). The Kaplan–Meier survival curve presents the proportion of unreturned questionnaires

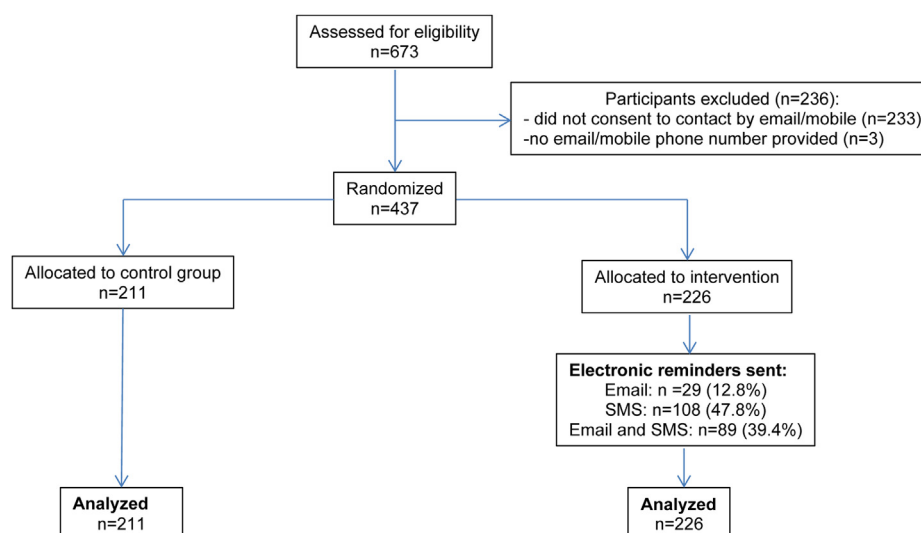


Fig. 1. Flow diagram of participants at each stage. SMS, short message service.

Table 1. Baseline characteristics

Variable	Group allocation	
	Control	SMS/email
Treatment, <i>n</i> (%)		
Test now	111 (52.6)	109 (48.2)
Waiting list	100 (47.4)	117 (51.8)
Gender, <i>n</i> (%)		
Male	102 (48.6)	132 (58.4)
Female	108 (51.4)	94 (41.6)
Age (yr)		
Mean (SD)	50.2 (9.2)	50.6 (9.6)
Median (range)	49.9 (35–73)	48.8 (35–82)

Abbreviations: SMS, short message service; SD, standard deviation.

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The median time to return the follow-up questionnaire was 23 days in the electronic prompt group and 33 days in the control group (Table 2). The Kaplan–Meier survival curve presents the proportion of unreturned questionnaires plotted against the time to return the questionnaire (Fig. 2). The log-rank test revealed some evidence of a difference in the time to return the questionnaire between the two randomized groups ($\chi^2 = 3.80$; $P = 0.05$). A Cox regression adjusted for age, gender, allocation (test now/waiting list), and practice gave a hazard ratio of 1.27 (95% confidence interval: 1.10, 1.47; $P = 0.001$).

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3.1. Review and meta-analysis

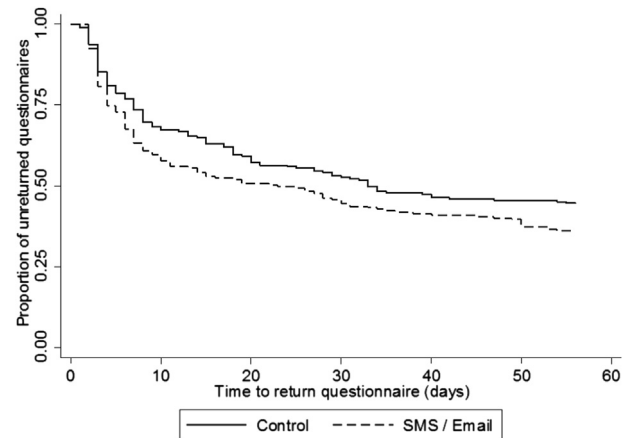
The Cochrane review identified only three trials that use electronic prompts to reduce attrition. However, one of these was excluded from the meta-analysis because it did not have a no electronic prompt control group. Consequently, we could only include our two previous trials [1,4]. Pooling these three trials in a meta-analysis (Fig. 3), we can see that overall OR is 1.48 (95% CIs:

Table 2. Time to return follow-up questionnaire (days)

Allocation	<i>N</i>	Median (95% CI)
Control	211	33 (21, *)
SMS/email	225	23 (11, 31)

Abbreviations: CI, confidence interval; SMS, short message service.

*Unable to estimate upper limit of confidence interval.

**Fig. 2.** Kaplan–Meier survival curve of time to return follow-up questionnaire. SMS, short message service.

1.04, 2.09; $P = 0.03$) or a 7.1% difference in response rates (95% CI: 0.8%, 13.3%).

4. Discussion

We undertook a “trial within a trial” of using electronic prompts (SMS and email) to improve response rates within our randomized trial of COPD diagnostic screening. We found an 8.8% increase in the overall response rates and a quicker time to response in those randomized to receive an electronic prompt compared with those not randomized to receive a prompt. The latest Cochrane review (published 2013) found only our two smaller trials of a similar intervention. The present findings are in line with our two previous, smaller, trials of using electronic prompts. In those two trials, we found a 5.4% difference (95% CI: −4.6%, 15.4%) among participants (mean age 46 years) in a migraine prevention trial [5] and 3% difference (95% CI: −10%, 16%) among participants (mean age 46 years) of a yoga trial for low-back pain [1]. This difference, although small, is not trivial, and in addition because of the low cost of the intervention, it would be worthwhile.

We undertook both an adjusted, using Cox regression, and unadjusted analysis and both analyses gave essentially the same result. The Cox regression by adjusting for gender and site would control for some chance imbalance in gender and for the site-specific differences in mailout times.

The limitations of the research design are that the research gained and conclusions reached apply to the participants who were taking part in the DOC study as well as those participants who have mobile and email addresses and are prepared to give them to the research team. In this study, and in our two previous studies, the participants were middle aged (46 and 47 years in our two previous studies and 50 years for the present study), and consequently, the

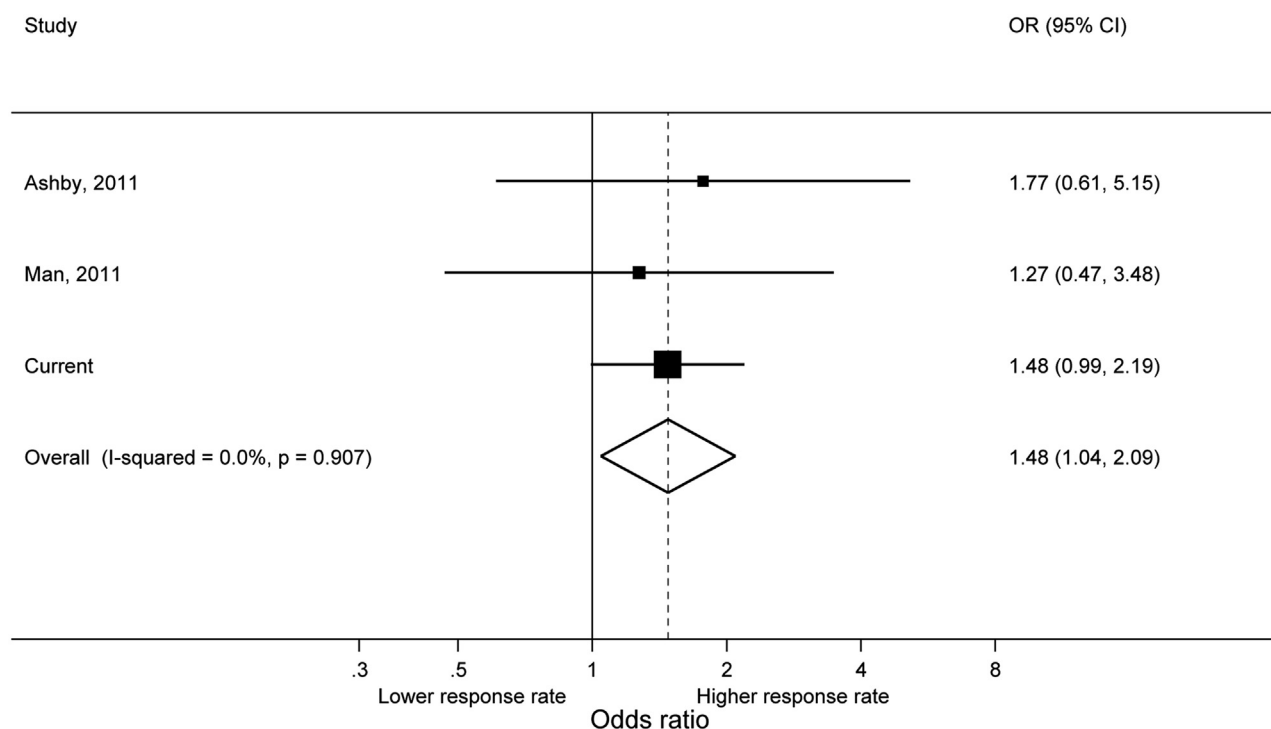


Fig. 3. Meta-analysis of studies exploring the use of electronic prompt to increase response rate. OR, odds ratio; CI, confidence interval.

results may not apply to older or much younger people. Nevertheless, when set in the context of the previous two studies, we have undertaken it seems likely that the use of electronic prompts sent to recipients of postal questionnaires on the day that they receive them is an effective strategy at increasing response rates.

Future research might look at assessing the impact of electronic prompts in older or younger populations or varying the content of the message. In a large trial of SMS messages, appealing to people to pay their fines on time found that a “personalized” SMS message (i.e., containing the name of the recipient) was more effective than a standard nonpersonalized message similar to the type we used [8]. Therefore, trials of personalized vs. nonpersonalized messages might be worthwhile. It is unlikely a single trial of personalized messages would be large enough and several smaller trials would probably need to be combined. For instance, to find a similar difference of 7% observed in our meta-analysis, we would need a sample size of 1,380 participants to give 80% power to show such a difference.

In conclusion, we found an increase in the overall response rates and a quicker time to response in those randomized to receive an electronic prompt compared with those not randomized to receive a prompt. Because the cost of sending automatic electronic prompts is so small (£0.08 per automated text message), almost any improvement in response rates would be worthwhile and certainly with

the effect demonstrated in this study. Consequently, we recommend the routine use of SMS and electronic mail reminders to improve questionnaire response rates in randomized controlled trials.

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