

The use of text messaging to improve attendance in primary care: a randomized controlled trial

Kwok Chi Leong^a, Wei Seng Chen^b, Kok Weng Leong^c,
Ismail Mastura^d, Omar Mimi^e, Mohd Amin Sheikh^f, Abu Hassan
Zailinawati^g, Chirk Jenn Ng^h, Kai Lit Phuaⁱ and Cheong Lieng Teng^j

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Background. Non-attendance is common in primary care and previous studies have reported that reminders were useful in reducing broken appointments.

Objective. To determine the effectiveness of a text messaging reminder in improving attendance in primary care.

Design. Multicentre three-arm randomized controlled trial.

Setting. Seven primary care clinics in Malaysia.

Participants. Patients (or their caregivers) who required follow-up at the clinics between 48 hours and 3 months from the recruitment date.

Interventions. Two intervention arms consisted of text messaging and mobile phone reminders 24–48 hours prior to scheduled appointments. Control group did not receive any intervention.

Outcome measures. Attendance rates and costs of interventions.

Results. A total of 993 participants were eligible for analysis. Attendance rates of control, text messaging and mobile phone reminder groups were 48.1, 59.0 and 59.6%, respectively. The attendance rate of the text messaging reminder group was significantly higher compared with that of the control group (odds ratio 1.59, 95% confidence interval 1.17 to 2.17, $P = 0.005$). There was no statistically significant difference in attendance rates between text messaging and mobile phone reminder groups. The cost of text messaging reminder (RM 0.45 per attendance) was lower than mobile phone reminder (RM 0.82 per attendance).

Conclusions. Text messaging reminder system was effective in improving attendance rate in primary care. It was more cost-effective compared with the mobile phone reminder.

Keywords. Reminder, primary care, non-attendance, text messaging, randomized controlled trial (RCT).

Introduction

Non-attendance is when the patient does not appear for his or her appointment. It is common in primary care and it has been reported to range from 6.5 to 42%.^{1,2} Non-attendance disrupts continuity of patient care, delays treatment and affects doctor–patient relationship. Furthermore, it deprives other patients

of earlier appointments, reduces efficiency of health systems and increases health care cost.

The main reasons for non-attendance were forgetfulness, practice error and a mix-up over dates and times³—all of which are remediable through appropriate reminder services. Various reminder systems have been assessed with varying degree of success. A meta-analysis by Macharia² revealed that mailed

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^aInternational Medical University, ^bKlinik Alam Medic, Puchong, ^cKlinik Leong, Puchong, ^dKK Ampangan, ^eKK Kelana Jaya, ^fKlinik Kota Bharu, ^gKlinik Keluarga, Wangsa Maju, ^hUniversity Malaya, ⁱInternational Medical University and ^jInternational Medical University. Correspondence to: Leong Kwok Chi, Department of Family Medicine, International Medical University, Jalan Rasah, 70300 Seremban, Malaysia. Email: leongk@pc.jaring.my

reminders and telephone prompts were useful in reducing broken appointments (OR 2.2 and 2.9, respectively). Providing patients with reasons for follow-up and obtaining formal agreement to attend future appointments also improved attendance. Other studies using reminder postcards and reminder telephone calls prior to appointment revealed significant differences between the control groups and those receiving interventions.^{4,5} Combinations of different reminder strategies have also reduced non-attendance up to 60%.⁶

Text messaging (also known as short messaging service or SMS or texting) is a new communication technology that allows a person with a mobile phone to send a text message to another mobile phone. The text messages are delivered almost instantly to the recipient mobile phone once it is switched on, but the text messages can then be read whenever convenient to the recipient. It is cheap, efficient, convenient and less intrusive compared with a mobile phone call. It is widely available and increasingly being used in many countries.^{7,8} It has been used in clinical care of patients with asthma,⁹ diabetes mellitus,¹⁰ travellers vaccination¹¹ and smoking cessation.¹²

Text messaging appointment reminder systems have been piloted in UK hospitals, but no formal results has been reported.¹³ A randomized controlled trial (RCT) in an orthodontic clinic comparing text messaging reminder and control groups did not report any significant difference in attendance rates.¹⁴ A cohort study in outpatient specialist clinics showed that text messaging was an effective reminder system; however, this study was limited by its study design using a historical cohort as control.¹⁵

So far, there has been no published RCT assessing text messaging reminder system in primary care. Therefore, we conducted an RCT to determine whether text messaging reminder system was effective in improving attendance in primary care. We also hypothesized that text messaging would be more effective and less costly than a mobile phone call.

Methods

Settings

The primary care services in Malaysia consist of public and private clinics. These clinics provide acute, chronic and preventive care and have on-site dispensing facilities. Most patients travel less than 30 minutes to reach the nearest available primary care clinic. Most patients walk in to seek care in these clinics without prior appointments, and they can seek care at any private or public clinics of their choice based on ability to pay, convenience and satisfaction with the services provided. The average charge in a private clinic is

RM30 while a patient has to pay only RM1 for care in the public clinic. (RM is Ringgit Malaysia, RM1 = Sterling £0.15) The charges include consultation fees and medications. The waiting time to see the doctor on arrival at the clinic is much longer at the public clinics compared with the private clinics.

The study was conducted in five private and two public primary care clinics.

Participants

The participants were patients who required follow-up at the clinics or their caregivers. The reasons for follow-up were recorded. The patients were eligible for inclusion if:

1. Their follow-up appointments fell between 48 hours to 3 months from the recruitment date.
2. They or their caregivers had a mobile phone with text messaging function.

The study period was between April and October 2005. Informed consent was obtained from all participants.

Interventions

In both text messaging and mobile phone groups, a reminder was sent using a mobile phone 24 to 48 hours prior to the appointment. The text messaging and mobile phone messages consisted of patient's name and appointment details. To avoid unequal intervention, the mobile phone conversation was similar to the text messaging reminder message and no clinical or laboratory information was included. Successful contact was assumed when there was an indication of 'message sent' on the mobile phone in the text messaging group or when the participants answered the phone in the mobile phone group. We did not leave voice messages in the mobile phone group. A maximum of three reminders were attempted in the intervention groups. In the control group, no reminder was sent.

Objectives

We hypothesized that text messaging reminders would be more effective than no reminder in improving attendance. In addition, we would like to compare the effectiveness and cost of text messaging with that of mobile phone reminders.

Outcomes

Attenders were defined as participants who turned up at any time during the clinic operating hours on the appointed day. Non-attenders were those who came on any day other than their appointed day, changed or cancelled their appointment and those who did not turn up at all (defined as more than 14 days later than appointed day).

Sample size

We assumed a baseline attendance rate of 50%. To detect a 15% absolute difference in attendance rates between text messaging reminder and no reminder, we needed 170 patients in each arm (power = 80%, $\alpha = 5\%$). To detect a 10% absolute difference in attendance rates between text messaging and mobile phone reminders, we needed 329 patients in each arm.

Randomization

The participants were randomized into three groups: no reminder (control), text messaging reminder and mobile phone reminder. An investigator who was not involved in patient recruitment and intervention created a randomization list using the block randomization method (software: Research Randomizer, <http://www.randomizer.org/form.htm>). A typical block for 18 research participants was as follows: 012, 021, 102, 120, 201, 210 (where 0 = control, 1 = mobile phone, 2 = text messaging); it represented all possible combinations of the above three interventions. The randomization list consisted of 56 blocks (equivalent to 1008 participants). The appropriate randomization list was then sent to each study centre. The research assistants responsible for enrolment were blinded to the intervention. The assigned intervention was revealed to the research assistants 48 hours prior to the scheduled appointment.

Cost-effectiveness analysis

We compared the costs of text messaging or mobile phone reminders by carrying out cost-effectiveness analysis. Effectiveness was measured by the attendance of the patients. In this study, the cost was studied from the viewpoint of the service providers only, as we assumed that the cost to society and the patients would be minimal, and would be similar in both programmes.

The total variable costs¹⁶ included:

- (a) Variable labour: the wages and benefits per hour of the project research assistants involved, multiplied with the time spent sending text messaging or phoning from the doctor's clinic.
- (b) Variable supplies: the text messaging and mobile phone telecommunication charges.

The wages and benefits were taken from the human resources records while the time spent sending the text messaging or phoning were recorded in time-activity logs. The text messaging and mobile phone telecommunication charges were recorded immediately from the notification of charges sent by the telecommunication company to the mobile phone after each transaction.

Certain fixed costs that would occur regardless of the number or type of reminders provided (e.g. housekeeping, administration costs, rent, building and equipment depreciation, insurance expenses, utilities) were not included. The capital cost of the mobile phone used to carry out the reminders was not included as this would be similar for both text messaging and mobile phone call. We assumed that additional fixed costs were minimal and that variable costs comprised the greatest portion of the individual programmes.¹⁷ Since costs and benefits were generated close to each other in terms of time, we did not consider it necessary to discount the costs and benefits.

Cost-effectiveness analysis was carried out to determine which method cost less per unit of effective intervention, i.e. cost per attendance (successful event). After the analyses, the ratio of cost per attendance for text messaging to mobile phone reminders was calculated.

Statistical methods

We used SPSS version 11.5 for data analysis. Intention to treat analysis was used. Attendance rates among the three groups were compared using chi-square test. Level of statistical significance was set at $P = 0.05$. For odds ratios (OR) calculation, the control group was used as the reference group. Where appropriate, number needed to treat (NNT) of the reminder intervention was also presented.

Results

Out of the 1111 patients we assessed, 993 were enrolled (Fig. 1). Of those who were excluded, 93 did not have mobile phones. Between 9 and 11 participants in each group did not receive the allocated intervention because they were assigned incorrectly by the research assistants. These 29 participants were included in the intention to treat analysis.

Baseline data

The demographic data of the participants were comparable in the three groups (Table 1). One-quarter of the participants were caregivers of the patients.

Outcomes

The attendance rates of control, text messaging and mobile phone reminder groups were 48.1, 59.0 and 59.6%, respectively (Table 2). The attendance rate of the text messaging group was significantly higher than that of the control group, but there was no difference between the text messaging group and the mobile phone group. For every nine text messaging reminders sent, one additional attendance was added. The text messaging reminder system cost less than half of the mobile phone reminder per attendance (Table 3).

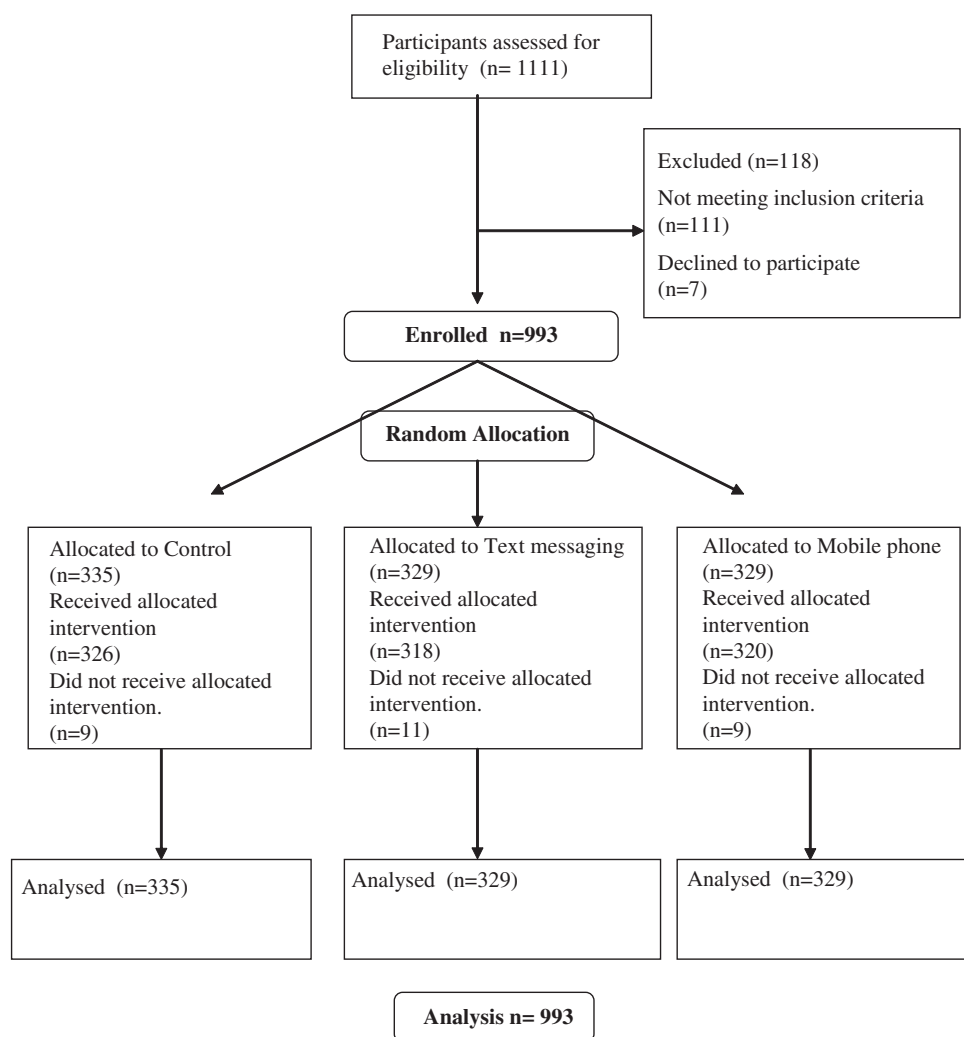


FIGURE 1 Participant flow

TABLE 1 Baseline data of participants

Characteristics	Control n = 335	Mobile phone n = 329	Text messaging n = 329	Total (n = 993)
Mean age (years)	37.8	38.4	38.4	38.2
Female gender (%)	65.4	62.3	65.7	64.5
Income ^a				
<RM1000	17.7%	23.8%	24.3%	21.9%
RM1001–RM3000	52.8%	52.3%	50.8%	52.0%
RM3001–RM5000	18.3%	14.9%	15.1%	16.1%
>RM5000	11.2%	9.0%	9.8%	10.0%
Reason for follow-up				
Chronic illness	42.1%	40.2%	41.6%	41.3%
Immunization/ preventive care	36.4%	34.3%	33.8%	34.8%
Others	21.5%	25.5%	24.6%	23.9%
Participant ^b				
Patients	76.0%	74.9%	76.0%	75.7%
Caregivers	24.0%	25.1%	24.0%	24.3%

RM is Ringgit Malaysia, RM1 = Sterling £ 0.15.

^an = 969, ^bn = 990.

Ancillary analyses

In subgroup analyses, the trend favours text messaging intervention, when the reason for re-attendance is for scheduled immunization and when the appointment is more than 4 weeks.

Discussion

This study showed that text messaging reminder was effective in improving attendance in primary care compared with a no-reminder control. It was also found to be more cost effective than mobile phone call reminders. This result may have significant impact on the choice of reminder system in primary care. Although the conventional telephone and mail reminders are effective in improving attendance, text messaging provides an alternative reminder system for primary care, which has a heavy patient load and requires an efficient appointment scheduling to improve attendance. Text messaging reminder can be

TABLE 2 Attendance rates by intervention types

Intervention	Attended (%)	P-value	Odds ratio (95% CI)	NNT (95% CI)
Text messaging versus control	59.0 versus 48.1	0.005	1.59 (1.17–2.17)	9 (6–25)
Mobile phone versus control	59.6 versus 48.1	0.003	1.55 (1.14–2.11)	9 (6–32)
Text messaging versus mobile phone	59.0 versus 59.6	0.874	0.98 (0.72–1.33)	Not applicable

TABLE 3 Cost effectiveness analysis

Characteristics	Text messaging (n = 329)	Mobile phone (n = 329)
Number of attendance	194	196
Numbers of intervention	318	400
Total time spent (hours) for the interventions	5.37	7.98
Average research assistant salary per hour (RM)	8.04	8.04
Total human resources cost incurred (RM)	43.17	64.16
Telecommunication cost incurred (RM)	44.49	96.17
Total costs incurred (RM)	87.66	160.33
Total cost per patient (RM)	0.27	0.49
Total cost per attendance (RM)	0.45	0.82
Ratio of total cost per attendance (success)	0.55	1.0
Ratio of total cost of reminders system	0.55	1.0

RM is Ringgit Malaysia, RM1 = Sterling £0.15.

made more efficient by linking the computerized appointment system to an automated system that will generate and send off prepared text messages. This would reduce manpower and mistakes due to human errors.

Implementation of a text messaging reminder system requires high mobile phone penetration rates among patients and their caregivers. Currently, the penetration rates of mobile phone ranged from 56.5% in Malaysia to 71.3% in Europe with an annual growth rate of 28.3 and 25.9%, respectively.^{7,8} However as people are more likely to change their mobile phone numbers compared with their land line telephones, text messaging reminder systems require regular updating.

Concerns have been raised about the privacy and confidentiality of the newer technologies.¹⁸ To address this issue, only participants' names and appointment dates were sent in the reminder messages. Care was taken to ensure no clinical information or laboratory results were conveyed in the messages.

Despite reminders, ~40% of the participants did not keep to their appointments. This figure is high compared with other studies.^{1,19,20} In Malaysia, most of the primary care clinics do not have an appointment system and, therefore, the participants in this study

might not be familiar with keeping to appointments. This could explain why 48% of the non-attenders came on days other than the appointed days. In health care systems where a patient is only attended to by appointment, text messaging may be more effective in improving attendance.

Economic evaluations

The cost-effectiveness analysis showed that it cost RM 0.45 per attendance for text messaging reminder as compared with RM 0.82 per attendance for mobile phone reminder. The ratio of cost per unit attendance of text messaging versus mobile phone was 0.55.

Since there was no statistically significant difference between text messaging and mobile phone reminders in terms of attendance rates, cost minimization analysis²¹ can be used to determine which reminder method had a lower cost. We found that text messaging was the cheaper option as suggested by the total costs i.e. RM 87.66 for text messaging reminders and RM 160.33 for mobile phone reminders. When we compared the two reminder systems, the ratio of the cost of text messaging versus mobile phone was 0.55. Therefore, our conclusion that text messaging was less costly was further strengthened.

It costs RM 2.65 per extra attendance gained for the text messaging arm and RM 4.58 for the mobile phone arm. Mobile phone reminders were more costly because the number of interventions was higher and each mobile phone conversation lasted longer compared with the text messaging reminders.

It cost RM0.27 per patient in the text messaging arm and RM0.49 per patient in the mobile phone arm. If a text messaging recall system is installed for all patients in the private clinics and RM0.27 added to their bill of RM30.00, there will only be a cost increase of 0.9% with the benefit of increasing attendance by 11%.

Limitations

In this study, attendance was defined strictly as those who attended the clinics on the scheduled dates. Those who came earlier or later were regarded as non-attenders. In practice, the quality of care would not be affected significantly in this group of patients.

As the text messaging reminder in this study did not require the participants to confirm receipt of reminders, we were uncertain whether all participants had received the text messages. However, assuming that those who did not receive messages were more likely to be non-attenders, this study would probably underestimate the effectiveness of text messaging reminder.

There was no attempt to leave messages in the answer-phone/voice-mail as the investigators were of the opinion that most people do not check their voice-mail and there is no way to check if the participants had retrieved their messages.

Economic effects would vary according to the prices of labour, mobile phone and text messaging charges in each country.

Further studies

We estimated that the total charges incurred with a land line to land line reminder is RM 96.24, assuming that the number of calls is the same as the mobile phone reminder. This total charge is comparable to that of the text messaging reminder (RM 87.66). We suspect that text messaging reminder could be considerably cheaper than land line to land line reminder because mobile phone users are more likely to be contactable, but this need to be verified by future research.

Ninety-three patients were excluded from this study because either they or their caregivers did not have a mobile phone. In implementing a text messaging reminder system, the needs of this group will need to be addressed.

The acceptability of a text messaging reminder system would be worth exploring in future research especially the issues of privacy and urgent messages rather than routine reminders.

The reasons of follow-up may have an impact on the attendance rates and, possibly, the effectiveness of different reminder systems. Further studies looking at the effectiveness of text messaging reminder in different types of follow-up will be warranted.

Conclusion

Text messaging reminder was effective in improving attendance rate in primary care compared with a no-reminder control. It was as effective but cost less than the mobile phone reminder.

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