

Efficacy of different reminders to reduce missed orthodontic appointments

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Objectives Since forgetfulness is the major cause of missed appointments, reminder systems can be used prior to appointments. The present study aimed to evaluate the efficacy of different reminders [e-mails, social networks, telephone, and short message service (SMS)] in order to reduce missed appointments by orthodontic patients.

Methods Of a total of 751 active orthodontic patients, 379 were assigned to the reminder group and 372 to the control group. The former group was randomly divided into four subgroups who received a reminder 2 days before their appointments either by telephone, e-mail, SMS, or a message on Facebook. Patients allocated to the control group received no reminder. The percentage of missed appointments and the demographic characteristics of patients in each group were analyzed with the chi-squared test.

Results The percentage of missed appointments was significantly higher in the control group (41.39%) than the reminder group (11.08%) ($P < 0.001$). There was no difference in the attendance rate of patients among telephone, SMS, and e-mail groups. Missed appointments were insignificantly higher in patients whose parents had the highest educational level ($P = 0.8$). In patients with low family income, the percentage of missed appointments was the lowest, but this difference was not statistically significant ($P = 0.5$).

Conclusion The study results indicated that sending reminders is an effective strategy to reduce missed appointments. E-mails and social networks can be employed to send reminders easily and cost-effectively and prevent missed appointments.

Keywords orthodontic, reminder system, appointment

Introduction

Patient non-attendance is a concern for all health care providers, especially orthodontists, because it incurs financial costs and results in loss of clinical time.^{1,2} Failed appointments have a significant effect on efficient scheduling of clinics and, as a result, on the economics of orthodontic practice.³

Moreover, success of orthodontic treatment depends, to a large extent, on regular adjustment of appliances or supervision of occlusal development. Patients who fail to keep appointments disrupt and prolong their treatment, representing a serious limitation of practice efficiency in orthodontics.^{4,5} They may also experience more detrimental side-effects such as development of white spot lesions.⁶ It has been shown that missed appointments decrease the likelihood of successful completion of orthodontic treatment.^{3,7,8}

In general, the percentage of failed appointments is related to a number of factors, e.g. age, sex, social class, level of education, large families, distance travelled, forgetfulness, availability of transport, illness, economic status, and source of payment.^{9,4} Research has revealed that forgetfulness is the most common and inability to get time off or find transportation is the second most common reason for missed appointments.^{10,11}

Since forgetfulness is the major cause of missing of appointments, reminder systems can be used prior to appointments. Various reminders have been assessed, with varying degrees of success, in reducing broken appointments. They include postal reminders,^{1,2,12} telephone reminders,^{1,13} and short message service (SMS) reminders.^{1,14}

According to Woolgrove et al,¹⁵ use of postal reminders decreased failed appointments from 33% to 27%. Other studies

also indicated that reminders were an effective strategy to reduce the non-attendance rate,^{2, 12-14} however, some other studies did not confirm such effectiveness.^{1,14,16} Another study reported that telephone reminders prior to appointments had no effect on the failure rate.¹⁶

Prasad and Anand¹⁴ found little difference in missed appointments between the reminder and control groups of patients presenting to the pedodontic department.¹⁴ Bos et al.¹ concluded that reminders are not useful for prevention of failed appointments and suggested that replication studies should be conducted.¹ This controversy shows that further research must be carried out.

As cell phones are increasingly used worldwide, SMS reminders can be utilized to increase the effectiveness and efficiency of health care delivery.¹⁷

SMS facilities on cell phones were introduced in the early 1990s and are currently one of the most widely used methods of communication.¹⁴ Recent advances in technology have enabled easier communication through electronic mails (e-mail) and social networks. To the best of our knowledge, there is no study assessing the efficiency of e-mail reminders or reminder messages on social networks.

Evidence suggests that the percentage of failed appointments is related to a number of socioeconomic factors, e.g. race,¹⁸⁻²⁰ but we found no similar study conducted in Iran. The aim of this study was to compare the effects of different reminders (e-mails, social networks, telephone, and SMS) on the attendance rate of orthodontic patients and evaluate the short-term efficacy of these reminders in comparison with no reminders for Iranian orthodontic patients.

Methods

The patients included in this study were selected among those who received orthodontic treatment at the Orthodontics Department of Shiraz Dental School, Shiraz University of Medical Sciences, Shiraz, Iran. The patients who were scheduled to present to this department from October 2012 for four months were included in this study. All active orthodontic patients wearing appliances who were scheduled for monthly appointments without any reminder were eligible for inclusion in this study. New patients and those in the observation phase were excluded.

Before the onset of the study, we collected some information from the patients, including their cell phone numbers, e-mail addresses, username on social networks, age, sex, socio-economic status, and level of education. Both the children and their parents were encouraged to answer the questions.

The sample was divided randomly into four reminder groups (telephone, SMS, e-mail, and Facebook) and one control group. The four reminder groups received a reminder 2 days before their appointments either by telephone, e-mail, SMS, or a message on Facebook.

Written messages in e-mail, SMS, and Facebook groups were in Persian and appropriate for second-graders. Reminders were considered to have been successfully delivered if the delivery report was received. The same text was read over the telephone for the patients allocated to the telephone group and therefore there was no further emphasis on patient attendance in the telephone group.

Text reminders were sent in the form of the following message:

Reminder: Orthodontic appointment at Shiraz Dental School on {Day} {Date}.

Please call {x} only if you cannot attend.

Patients allocated to the control group received no reminder. The patients' numbers, rather than names, were used to maintain anonymity. The clinician was blinded to whether patients were reminded or not. The following patients were excluded from the study: those who had rescheduled or canceled their appointments one day before, those whose phone numbers were incorrect, those whose cell phones were off or did not answer the call and those who could not be reached.

Attendance or nonattendance was recorded at the time of appointment. Therefore, missed appointment means "no-show", not rescheduled appointments.⁸

At their appointments, all subjects were informed that the reminders were part of a study and not part of a new routine regimen.

We measured the percentage of missed appointments in each group separately and then compared the percentage of missed appointments among the groups.

The demographic data (age, sex, socioeconomic status, and level of education) were extracted from the questionnaires which had been completed by the patients. We evaluated the relationship between the age, sex, and socio-economic status of the patients and attendance rate in each group, in order to understand how these factors affect the influence of each reminder system.

The data were analyzed with the chi-squared test in Stata 13 (Stata Corp., College Station, TX, USA).

Results

A total of 870 scheduled patient appointments were initially included. However, 119 subjects were excluded because they could not be reached since their mobile phone numbers or e-mail addresses were incorrect.

Consequently, our final analyses were based on 751 subjects. Of a total of 751 patients, 379 were in the reminder groups (94 males, 285 females) and 372 patients were in the control group (108 males, 264 females).

Overall, 494 (65.8%) appointments were recorded as kept, 196 (26.1%) as missed, and 61 (8.1%) as cancelled.

The number of missed appointments was significantly higher in the control group than the reminder groups ($P < 0.001$). In the latter groups, of 379 appointments in each reminder group, 42 appointments (11.08%) were missed. In the control group, of 372 appointments, 154 were broken. The percentage of missed appointments in the control group equaled 41.39% (Table 1).

Pairwise comparison of groups showed that the frequency of missed appointments was significantly higher in the control group than in any reminder group. Table 2 presents the comparisons of missed appointments between groups.

The demographic data of the questionnaires which were completed and returned were also analyzed.

In the control and reminder groups, the percentage of female patients was significantly higher than male patients ($P = 0.01$).

The age range of almost half of the patients in the control and reminder groups was between 20 and 30 years. The highest mean age was observed in the Facebook group (28.3 years) and the lowest was seen in the SMS group (20.7 years), and this difference was significant ($P = 0.01$).

There was no significant difference in terms of parents' level of education among the groups ($P = 0.8$). Parents' level of

Table 1. Frequency of kept, missed, and cancelled appointments in the control and four reminder groups

Groups	Appointment			Total
	Yes (Kept)	No (Missed)	Cancelled	
Telephone	114 (72.6%)	16 (10.2%)	27 (17.2%)	157
SMS	126 (75.4%)	21 (12.6%)	20 (12%)	167
E-mail	36 (70.6%)	5 (9.8%)	10 (19.6%)	51
Facebook	2 (50%)	0 (0%)	2 (50%)	4
Control (No reminder)	216 (58.1%)	154 (41.4%)	2 (0.5%)	372

Table 2. Pairwise comparison of the frequency of missed appointments between groups

	Control	Telephone	E-mail	SMS
Control				
Telephone	<.001*			
E-mail	<.001*	0.92		
SMS	<.001*	0.36	0.36	
Facebook	<.001*	<.001*	0.33	0.07

*Significant at the 0.05 level.

Table 3. **Demographic characteristics (sex, age, parents' level of education, and family income) of patients in the control and reminder groups**

Variables	Controls	Cases	P-value*
Sex			0.01
Male	18 (40.9%)	17 (20.7%)	
Female	26 (59.1%)	65 (79.3%)	
Age (years)			0.7
Mean (SD)	22.5 (6.2)	22.8 (5.9)	
<20	19 (43.2%)	32 (39.0%)	
20–30	20 (45.5%)	43 (52.5%)	
>30	5 (11.3%)	7 (8.5%)	
Parents' level of education			0.7
High school or lower	11(26.2%)	23 (29.1%)	
High school diploma	13 (31.0%)	29 (36.7%)	
University	18 (42.8%)	27 (34.2%)	
Income (Tomans) Low (<500,000)	9 (21.4%)	29 (36.2%)	
Moderate (500,000-1,000,000)	21 (50.0%)	30 (37.5%)	0.2
High (>1,000,000)	12 (28.6%)	21 (26.3%)	

*Significant at the 0.05 level.

Table 4. **Percentage of kept, cancelled, and missed appointments based on parents' level of education and family income in the groups**

	Appointment			P-value
	Kept	Cancelled	Missed	
Parents' level of education				
High school or lower	73.5%	5.9%	20.6%	
High school diploma	78.61%	9.5%	11.9%	0.8
University	71.65%	6.1%	22.25%	
Family income (Tomans)				
<500,000	73.6%	13.2%	13.2%	
500,000- 1,000,000	70.6%	5.9%	23.5%	0.5
>1,000,000	75.8%	9.0%	15.3%	

education was insignificantly higher in the control group than in the reminder groups ($P = 0.7$).

The monthly family income for most patients in all groups was in the moderate range (500,000–1,000,000 Tomans), while most patients in the SMS group had a low income (<500,000 Tomans) ($P = 0.03$) (Table 3).

Missed appointments were more frequent among patients whose parents had the highest level of education, but this difference was not significant ($P = 0.8$).

In patients with a low family income, the percentage of missed appointments was the lowest, but this difference was not statistically significant either ($P = 0.5$) (Table 4).

Discussion

In this study, 65.8% of appointments were recorded as kept and 26.1% as missed. The percentage of missed appointments

was higher than the value reported by Trenouth and Hough,¹¹ i.e. 14% for orthodontic patients.

In the present study, missed appointments were significantly more frequent in the control group (41.39%) compared to the reminder groups (11.08%) ($P < 0.001$). We did not evaluate factors which might increase the frequency of missed appointments. Nevertheless, in medicine and general dentistry, apprehension,²¹ age,^{22,23} sex,²¹ level of education,^{22–24} social class,^{22,25} distance travelled,^{11,12,22,23} dental status,^{26,27} depression,²² and the time interval between receiving the appointment and the appointment date^{22,24} have all been implicated as factors contributing to patients failing to keep appointments. Walsh et al.²⁸ concluded that the most commonly cited reasons for failing appointments were communication failure (23%), geographical separation (20%), forgetfulness (11%), illness (20%), and transportation problems (7%).

Skarete et al.¹⁰ found that the following factors increase the risk of missed dental appointments: self-reports of forgotten dental appointments, not attending school, having high caries experience, and reporting negative beliefs about dentists. Furthermore, subjects who do not finish their dental treatment at the age of 18 years are at-risk for future drop-out from dental care.¹⁰

Smith et al.²⁹ reported that patients with significant pretreatment mental health concerns reported higher levels of dental fear and more frequent missed appointments. In addition, Kleinknecht and Bernstein³⁰ found that only 8% of the low-fear patients missed their appointments, compared to 24% of the high-fear group. Another study concluded that anxiety, combined with lack of concern about the preservation of teeth, was significantly associated with irregular attendance.²⁷ On the other hand, Trenouth and Hough¹¹ showed that patients who had missed appointments appeared no less concerned than those who had not.

Patients who are well informed about medical and dental procedures have been found to adhere to therapeutic regimens more than patients who do not comprehend the medical procedures they subsequently undergo.^{31,32} However, in orthodontics, both parents and children recall fewer items than they are told by the orthodontists.³³ The only exception was parents, reports of their responsibilities associated with their children's treatment, they listed more areas where they could help their children than the orthodontist had mentioned.³³ Therefore, it might be helpful to use the parents' potential for reminding the children of their appointment. In the present study, all patients received an information list including reasons for treatment, procedures, alternatives, benefits, risks, and responsibilities of parents and children.

According to Haynes,³⁴ patient age is directly proportional to the discontinuation rate of treatment. That is, the older the patients, the higher the failure rate. In the present study, although the age range of the Facebook group was significantly higher than the SMS group, there was no significant difference among reminder groups in terms of missed appointments. Also, Bos et al.¹ concluded that age is irrelevant to attendance rate.

In this study, the percentage of female patients was significantly higher than male patients in all groups. This might be due to the importance of dental appearance and attractiveness for women.³⁵ In this study, 71.4% of missed appointments in the control group were by females. In agreement with this finding, some studies^{2,9} state that females have a slightly higher failure rate than males. Others,^{1,36} however,

report that the discontinuation rate is equal between males and females. Puberty is a period of life with important biological and cognitive developments.¹⁰ Unstable emotional factors in this period probably influence the increased rate of school dropouts³⁷ and the dental attendance behavior.¹⁰ On the contrary, in the study by Lindauer et al.,⁶ males were significantly more likely to miss appointments.

According to Fazio and Boffa,²⁰ patients who pay for their own treatment tend to keep their appointments. In addition, other studies found that exemption from paying a fee seems to lead to an increased appointment failure rate.^{3,38} In the present study, patients with a low family income had the lowest percentage of missed appointments, but this was not statistically significant ($P = 0.5$). Can et al.,² however, revealed that patients from areas with a higher social deprivation were less likely to attend. They obtained the details of the patients' socio-economic status expressed as the Townsend index based on their home postal code.² They also suggested that the main reasons for non-attendance of people who live in deprived areas are more complex than simply forgetting the appointments.² Providing appointment reminders, which is found to be significantly effective for increasing appointment attendance for orthodontic patients,^{2,13} was not shown to be effective for patients in low socio-economic areas.² Common reasons for failed appointments given by such patients included difficulty in taking the time off work and arranging transportation.² Lack of transportation was also identified by Paul and Hanna³⁹ as an important determinant of no-show behavior among low-income patients. In Richardson's study, more than 20% of patients spent over 45 minutes on the way to the hospital.⁴

Several studies^{9,20,40} reported that Medicaid patients missed appointments more than non-Medicaid patients, and suggested that a minimal out-of-pocket expense should be required for Medicaid patients because, without a financial investment, patients are not motivated to keep appointments.

Alpert¹⁹ found that families of patients who missed appointments were almost twice as likely to have unpaid medical bills. It is logical to believe that they may view skipping an appointment as a way to reduce the accumulation of further debt if the patient mistakenly assumes that the payments are somehow tied to the number of visits attended.⁶

Kotraba⁴¹ believes that, once treatment exceeds 2 years, co-operation begins to decline. In Richardson's study, more than half of the patients who failed appointments thought they were near the end of treatment.⁴ Trenouth³ stated that the total number of failed appointments appeared to be related to the total number of appointments. Hurtado et al.⁴² identified a significant relationship between the number of broken appointments and the total number of scheduled appointments, which can account for the relatively high failure rate among orthodontic patients.

Based on Trenouth and Hough,¹¹ cancellation can be a warning sign for future appointment failure. Moreover, patients who miss one appointment are significantly more likely than other patients to miss additional appointments¹¹

Some studies hypothesized that two or more failed appointments during active treatment are highly indicative that a patient will not complete the prescribed course of treatment.^{7,10} Therefore, strategies to reduce failed appointments should be targeted toward the early stages of treatment.³ Differences in the overall treatment time due to missed appointments were not considered in the present study.

Further research is needed to determine the extent to which missed appointments affect treatment progress.

Although anxiety is the most common cause of missed appointments in other dental fields, forgetfulness is the reason most cited by orthodontic patients.^{11,15} If forgetfulness is the major cause of broken orthodontic appointments, a reminder system should eliminate this problem.¹³

In the present study, the percentage of missed appointments was significantly lower in the reminder groups (11.08%) than the control group (41.39%).

Similarly, in the study by Lindauer et al.,¹³ broken appointments were significantly less common in the group that received reminder calls. In their study, the patients found the reminder calls to be valuable and desirable and most of them wished to have the calls continued in the future.¹³

In the present study, no difference was observed between the attendance rate of patients in telephone, SMS, and e-mail groups. Similarly, according to Trenouth and Hough,¹¹ the method of reminding is not significantly related to appointment cancellations.

Bos et al.¹ concluded that, although subjects showed a clear preference for mailed reminders over telephone calls or SMS messages, type of reminders had no effect on the patients' attendance, and no difference was seen among telephone, mail, and SMS reminder systems. This might be attributed to the high attendance rate (83%) of patients in that center. Bos et al.¹ suggested that replication studies should be performed.

Reekie and Devlin⁴³ reported that there was a reduction in the failed attendance rate from 9.4% (no reminder) to a minimum of 3% by reminding patients, with any method. However, there was no significant difference among the four reminder groups (postal, manual telephone calls, automated telephone calls, and automated telephone calls plus reminder).

Both written (postal) reminders and telephone calls have been found successful in reducing missed appointments in other dental and medical practices.^{12,15,38,43-45} Postal reminders decreased the prevalence of failed appointments by 30–75% in one American study.²² Can et al.² showed that postal reminders affect the attendance of patients. Nevertheless, routine postal notification may be impractical for orthodontic patients because of the frequency and timing of appointments.¹³

In another study on telephone reminders,¹³ the failure rate fell from 7.6% to 1.9%. Another study, however, found that telephone reminders prior to appointments had no effect on failure rate.¹⁶ According to Prasad and Anand,¹⁴ little difference was found between the reminder and control groups in attending the pedodontic department. This might be due to the fact that, in the noted department, reminders were sent to the caregivers.¹⁴

Lindauer et al.⁶ concluded that appointments which were originally made by postcards were more likely to be missed than appointments made in person or by phone. Nelson⁴⁶ showed that voice messages were more effective than text messaging. This may be because voice reminders are more interactive than text messages which can be easily ignored.

Downer et al.⁴⁷ reported that SMS is a suitable means of improving patient attendance. Chen et al.⁴⁸ also found that attendance rates were significantly higher in SMS and telephone groups than in the control group. However, there was no difference between the SMS group and the telephone group. SMS reminder proved to be more cost-effective than telephone reminder.⁴⁸

Leong⁴⁹ found that the attendance rates of control, text-messaging, and mobile phone reminder groups equaled 48.1%, 59.0%, and 59.6%, respectively. No difference was observed between the text messaging group and the mobile phone group.⁴⁹ SMS messages have a number of characteristics that make them suitable in healthcare settings. They include direct patient communication, privacy, confidentiality, rapid delivery of messages and receipt of responses, and convenience for health providers and patients.¹⁷ SMS, e-mail, and social networks, which are cheaper than phone calls or postal methods, allow sending a substantial number of messages simultaneously, thereby reducing labor expenditure.^{14,17,50} Although fewer patients would be expected to miss appointments as a result of reminders, and thus increasing practice efficiency, valuable staff time is required to make the reminders.¹³

One limitation of the present study was that we did not know whether the patients came for their appointments because of their own prior decisions or other factors. We suggest that future studies evaluate the etiology of missed appointments.

Since the randomization scheme was based on each appointment, some of the patients who had more than one scheduled visit during the study period were included in both case and control groups at some point over the study period.

Based on Linthorst and de Metz,⁵¹ missed appointments are more common when the weather is warm and sunny. Seasonal variations related to scheduled testing in schools or the local weather might also affect attendance rate.⁵¹ The present study, however, gave only a snapshot view and takes no account of either etiology or seasonal variations.

In the present study, sample size in e-mail and social network groups was small. As a result, a randomized, controlled clinical trial is required to fully determine the potential benefits of e-mail and social network reminders.

Conclusion

When the percentages of missed appointments were compared, significantly higher number of failed appointments was observed in the control (no reminder) group compared to the reminder groups. There was no difference between the attendance rate of patients in telephone, SMS, and e-mail groups. Communicational advancements such as e-mails and social networks are easy and cost-effective reminders which seem to be useful for prevention of failed appointments. However, further research is required on these methods.

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Author Disclosure Statement

No competing financial interests exist.

Conflict of Interest

"None Declared." ■

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